VOL. XII NO. 2

UNITED STATES NAVAL MEDICAL BULLETIN

PUBLISHED FOR THE

INFORMATION OF THE MEDICAL DEPARTMENT OF THE SERVICE

ISSUED BY
THE BUREAU OF MEDICINE AND SURGERY
NAVY DEPARTMENT
DIVISION OF PUBLICATIONS
MEDICAL INSPECTOR J. S. TAYLOR, U. S. NAVY
IN CHARGE

APRIL, 1918

(QUARTERLY)

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NAVY DEPARTMENT,
Washington, March 20, 1907.

This UNITED STATES NAVAL MEDICAL BULLETIN is published by direction of the department for the timely information of the Medical and Hospital Corps of the Navy.

TRUMAN H. NEWBERRY,
Acting Secretary.

NOTE.

Owing to the exhaustion of certain numbers of the BULLETIN and the frequent demands from libraries, etc., for copies to complete their files, the return of any of the following issues will be greatly appreciated:

Volume I, No. 1, April, 1907.
Volume I, No. 2, July, 1907.
Volume II, No. 1, January, 1908.
Volume VII, No. 3, July, 1913.
Volume VIII, No. 3, July, 1914.
Volume IX, No. 2, April, 1915.
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PREFACE.

The publication and issue of a quarterly bulletin by the Bureau of Medicine and Surgery contemplates the timely distribution of such information as is deemed of value to the personnel of the Medical Department of the Navy in the performance of their duties, with the ultimate object that they may continue to advance in proficiency in respect to all of their responsibilities.

It is proposed that the NAVAL MEDICAL BULLETIN shall embody matters relating to hygiene, tropical and preventive medicine, pathology, laboratory suggestions, chemistry and pharmacy, advanced therapeutics, surgery, dentistry, medical department organization for battle, and all other matters of more or less professional interest and importance under the conditions peculiar to the service and pertaining to the physical welfare of the naval personnel.

It is believed that the corps as a whole should profit, to the good of the service, out of the experience and observations of the individual. There are many excellent special reports and notes beyond the scope of my annual report being sent in from stations and ships, and by communicating the information they contain (either in their entirety or in part as extracts) throughout the service, not only will they be employed to some purpose as merited, but all medical officers will thus be brought into closer professional intercourse and be offered a means to keep abreast of the times.

Reviews of advances in medical sciences of special professional interest to the service, as published in foreign and home journals, will be given particular attention. While certain medical officers will regularly contribute to this work, it is urged that all others cooperate by submitting such abstracts from the literature as they may at any time deem appropriate.

Information received from all sources will be used, and the bureau extends an invitation to all officers to prepare and forward, with a view to publication, contributions on subjects relating to the profession in any of its allied branches. But it is to be understood that the bureau does not necessarily undertake to indorse all views and opinions expressed in these pages.

W. C. BRAISTED,
Surgeon General United States Navy.

U. S. NAVAL MEDICAL BULLETIN.

Vol. XII. April, 1918. No. 2.

SPECIAL ARTICLES.

A SEARCH FOR NONPHYSICAL STANDARDS FOR NAVAL AVIATORS.

By R. P. Parsons, Assistant Surgeon, United States Navy.

The subject of physical standards for aviators has been much discussed since our entrance into the war. Each writer upon the subject has sought to add more ideals to the already lofty set of standards. Indeed, if all the ideals that have been set forth were ever complied with by any one of our aviators one might point to him and truly say, "Behold, the perfect man!" No one but Bernard McFadden, Douglas Fairbanks and Jess Williard could qualify, and the great Guynemer, with all his nerve, would not have the boldness, were he alive, to apply for enlistment in our flying corps.

Our Navy has already rejected hundreds of applicants because of trivial minor defects, most of whom, it is safe to say, could have become successful aviators. It is a fact that a great many of these rejected men have been admitted to the Canadian Royal Flying Corps, where they have made good to an extent that would indeed be disturbing to the medical officers in our service who rejected them.

Recently the conscience of a medical officer at one of our flying camps was troubling him greatly because he had just discovered that the camp's best flyer had flat feet! He was even more perplexed upon finding that another of the camp's aviators, a man of unquestioned flying ability, had but 16/20 vision in one eye. It is difficult to imagine what his mental state would be should he learn the fact that one of Britain's greatest flyers has but 4/20 vision (uncorrected) in one eye and not a great deal more in the other.

An aspiring aviator who would enter our service, but who enjoys anything less than the established 15/15 in either ear is liable to rejection. Though no one can hear any other sound in the presence of an aeroplane motor in action, still the candidate must have fifteen-fifteenths hearing if he would be one of our aviators. It is true that the aeronaut plugs his ears tightly with cotton before a flight, to be less annoyed by the sound of his motor; but underneath the cotton he still has his fifteen-fifteenths or he would not be in our service. Last year it was discovered by a naval medical examiner at Pensacola that a certain officer with the rank of lieutenant com-

mander had subnormal hearing in both ears. In view of the officer's excellence as an aviator, a waiver was requested by the doctor in order that the officer in question might continue at his valuable air duty. It was only at the end of much debate and discussion and a voluminous correspondence covering a period of several months that the waiver was granted and the aviator permitted to continue his air duty.

Two medical officers have been known to scratch their heads and ponder for a half hour before accepting a man who was a *quarter of an inch* shy on his chest expansion. The man settled the problem for them by succeeding, after many futile attempts, in getting the expansion up to the required standard.

Let us remember that, after all, we want for the personnel of our flying corps men who can fly, or at least who can learn to fly.

By the use of our present standards only men of excellent health and having no physical defects are admitted. No one can say that, other things being equal, men who enjoy perfect health are not preferable as flying corps material to those who do not enjoy it. But the trouble is that these "other things" never are equal. That is why we see so many cases of men in perfect health who are failures as aviators. The "other things," in fact, are so extremely unequal as to account for cases like that of Stinson, who, while failing to pass the physical examination of our Army, happens to be, nevertheless, America's greatest aviator.

As we learn of more and more cases of "perfect health" men who can not learn to fly and of more and more cases of the not "perfect health" men who are becoming, or are, famous flyers, we acquire the conviction that in selecting material for our flying corps, an examination which is purely physical is far from being infallible. We become convinced also that there is a "something else," whatever it may be, that is worthy of investigation, and which should be deemed fully as important as a physical examination for use as a criterion by which men are to be selected or rejected in the recruitment of student aviators. Granting this, we are confronted with the question: "What, then, is the 'something else'?" "What are these 'other things' and how can they be assessed in examining the applicant?"

In reply, it can only be said that the answer to these questions is not known. At least, the exact value of what knowledge has already been obtained is still unknown.

In the study of this problem, the advice of the flight instructors was sought. If anyone knows flight pupils, surely the flight instructor does. If anyone can say why it is that some pupils fail and others succeed, surely it is the instructor. He it is who studies the faults of this pupil, the merits of that one. He, if any one can,

ought to know what are the qualities that comprise the making of a successful aviator.

A great number of flight instructors were asked to state what they considered the most essential qualities contributing to the making of a successful aviator.

There was a unanimous agreement on some points, a general agreement on others, and a disagreement on a few others. To summarize the points unanimously agreed upon, the successful aviator must have the following characteristics:

1. Coolness under strain.
2. Dependableness to always do the correct thing at a critical moment.
3. Mental and physical alertness.
4. Lack of any inherent fear of being in the air.
5. Persistence and perseverance in his ambition to become a successful aviator.

The points generally agreed upon were that he must be—

1. Intelligent.
2. Athletic and endowed with good muscular coordination.
3. Possessed of a keen sense of equilibrium.
4. A good judge of velocity and distances.

There was disagreement as to whether the temperamental type of extreme stolidity or that of great nervous energy was preferable, many cases being cited of men of each type who had proved their expertness as aviators. Two instructors regarded physical strength as a valuable asset, but on being questioned most of the instructors deemed it not indispensable, citing cases that clearly disproved the contention of those two instructors.

There was a notable paucity of opinions concerning qualifications which were purely physical; indeed, the question of exceptional vision was mentioned by only one instructor.

Some of them practically said, "Show us a skillful motorcyclist or automobile driver, and we will show you the making of a good aviator." It is a well-established fact that good motorcyclists and automobile drivers do invariably make good aviators. But how are we to measure a man's ability as a motorcyclist or chauffeur in the medical examining room? And, then, too, are we not going astray in our interpretation of cause and effect in thinking that it was the motorcycling or automobiling ability that produced the flying ability, instead of analyzing the proposition to the conclusion that the same factors which were responsible for making the man a skillful motorcyclist were responsible also for making him a skillful aviator?

It is these "factors," these "other things," this "something else" spoken of before, that we are in search of, and which, perhaps may

be found, in part at least, in the summarized opinions of the instructors.

The one way of determining the value of these opinions is to measure these qualities in the aviation students, if possible, and then to determine what the correlation is between these measurements and the flying ability of the men measured.

An attempt is being made to devise means of measuring the qualities that the instructors tell us are important. Tests which are designed to measure these qualities have already been conducted on 250 students at the naval aviation ground school.

Of the 250 men tested, 74 had been under instruction at Pensacola and Hampton Roads and had done enough solo flying for their instuctors to form definite opinions regarding their ability as flyers.

Before comparing the test performances of these 74 men with their actual flying ability something should be said about the tests. All the tests were conducted in exactly the same way, and under precisely the same conditions for each man, though some of the men, for various reasons, were not given all of the tests.

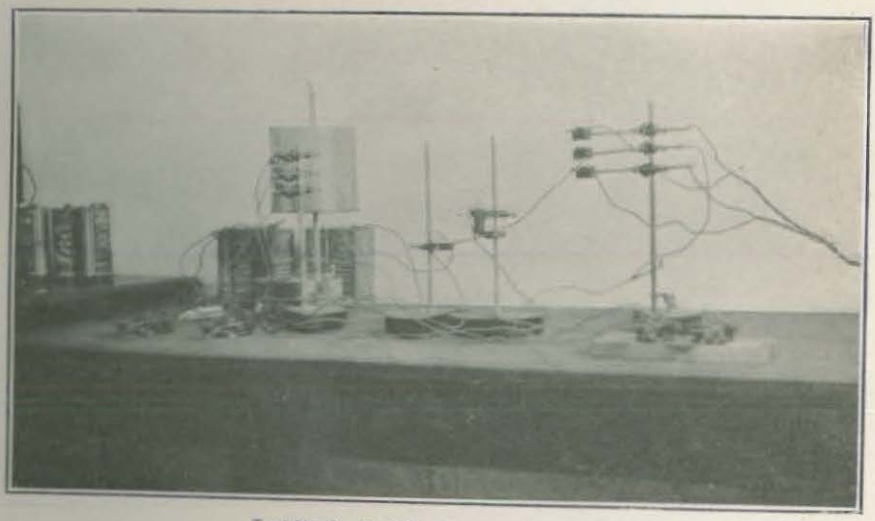
The technical details of the tests, being both tedious and of a more or less confidential nature, must necessarily be omitted. Most of them were made possible by the work of Dr. L. E. Troland and Dr. H. E. Burtt, of the Harvard Psychological Laboratory, who suggested their use and devised the apparatus for conducting them.

Test No. 1 is designed to measure a man's composure, "coolness" or presence of mind; or better, the extent to which he "keeps his head" under a condition which is very capable of producing emotion. During the procedure the subject is doing as rapidly as possible an arithmetical test which involves the addition of several sets of figures. The time required for his addition of each figure is automatically recorded in tenths of seconds. Simultaneously a graphic record is being made of his pulse and respiration. At some point in the course of the test, the stimulus referred to is introduced. The test completed, the difference in the average time for each addition before and each addition after the introduction of the stimulus is computed. The time elapsing after its introduction, before the subject returns to his previous rate of addition, is also computed. The exact changes that the shape, rate and rhythm of the pulse and respiration suffered after the introduction of the stimulus are carefully measured, as well as the time elapsing after its introduction, before the subject returns to his previous state as regards pulse and respiration.

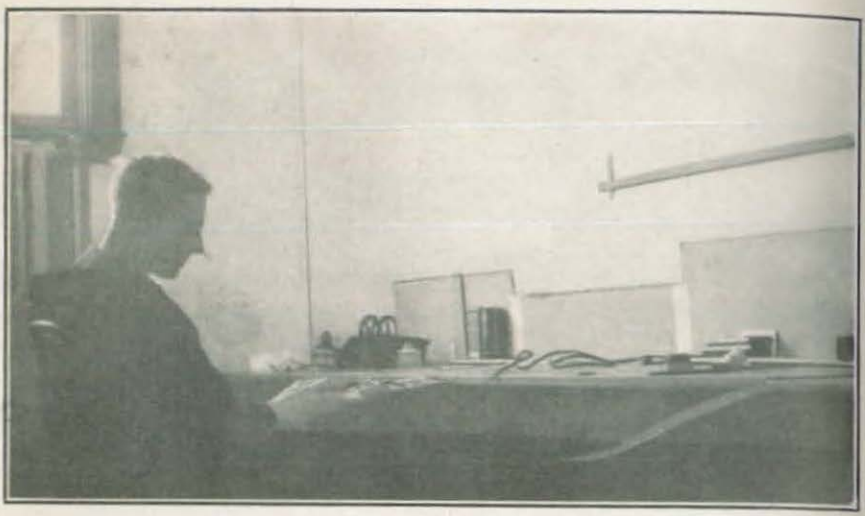
Test No. 2 is a measure of a man's alertness. This is done by the well-known methods of reaction time measurements. Several measurements are made of the subject's visual, auditory, and tactual reaction times, the average for each being recorded separately.

Test No. 1.—Measurements of emotion.

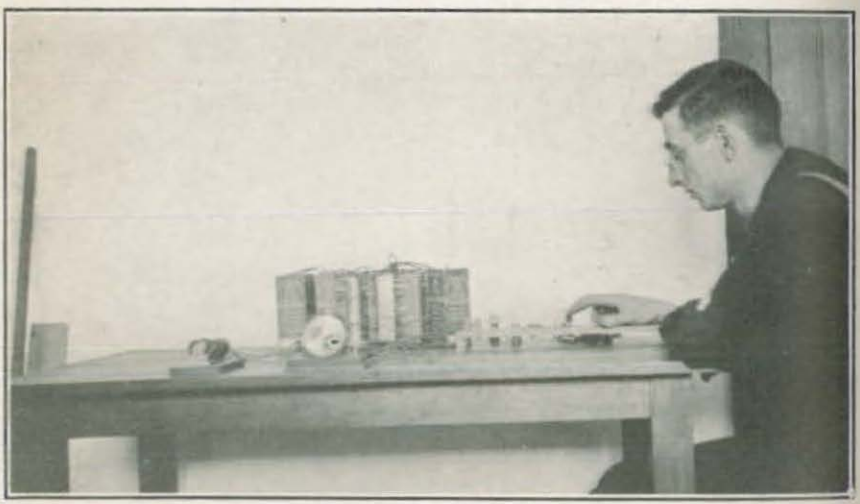
Test No. 8.—Equilibrium reaction time.



Test No. 2.—Reaction time measurements.



Test No. 5.—Measurement of judgment of distances and velocity.



Test No. 10.—Troland-Pressy machine measurements of intelligence and learning rate.

Test No. 3 is a measurement of muscular coordination. The subject executes a certain movement, involving the use of a certain set of muscles, as rapidly as possible. Each execution being recorded graphically, the rate and regularity of the movements can be computed.

Test No. 4 was designed for the purpose of measuring to some extent a candidate's mental alertness. It consists in the measurement in tenths of seconds of the time required by the subject to read a set of words with reversed spelling, the time for each word being recorded, and the number of mistakes noted.

Test No. 5 is designed to measure judgments of distances and velocity and the correlation of the two. The candidate watches an object which traverses at a constant speed the length of a long screen, at a part of which is a gap. He is instructed, before being tested, to stop the object when it has reached a distance beyond the gap equal to the length of the gap. The subject can stop the object instantly by pressing a telegraph key which he holds in his hand. This test measures his judgment of just how long the gap is, how fast the object is traveling and his correlation of the two. Several trials are made, his error in centimeters being recorded in each case. A meter stick hangs on the wall above the gap whose ends do not coincide with the edges of the gap. The subject now has several trials at stopping the object at a distance beyond the gap equal to the length of the stick. His error on each trial is recorded. The purpose of this part of the test is to determine whether the subject considers the length of the meter stick the same as that of the gap, the latter being, in fact, somewhat longer. In the third part of the test he attempts to stop the object directly behind a point marked in front of the screen, the point being about two meters beyond the gap. After each trial in the third part of the test, the subject is informed of his error, that his success in correcting his faulty tendencies may be measured. The average error for all trials is computed.

Test No. 6 is used to measure the power of observation. This has less relation to actual flying than it has to the other work that is required of a naval aviator. However, one who is a careful observer is more apt to be the kind who will learn to fly quickly than one would be who does not observe carefully. The nature of this test is such that its employment determines whether the subject is or is not of the type that always tries to do the best he can. The subject is given one minute to look at a distant scene which appears within a circle. He then sketches upon a paper circle the objects he saw. He is now shown for two minutes another distant scene which lies within another circle. A half hour later (after having gone through the other tests) he sketches the second scene upon another

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paper circle. In grading the pictures the artistic element is entirely disregarded, attention being given only to the accuracy with which the objects have been placed in their relation to each other, and to the number of objects correctly included in the sketch.

Test No. 7 is used to detect, if possible, the existence of any unusual fear of flying. One hundred words are read to the subject. Fifty of these words pertain to aviation and its attendant dangers; the other 50 have no connection with the subject of aviation. The 100 words are shuffled, so that those of the two kinds do not follow each other in any regular order. For each word the subject is to respond with the first thought that enters his mind. The time elapsing between the reading of the word and the subject's response is recorded in fifths of seconds. The test completed, the total response time for one set of 50 words is compared to the total response time for the 50 words of the other set. The nature of the responses is also analyzed.

Test No. 8 is an equilibrium reaction time measurement. The subject sits in a chair placed upon a platform which can be made to tip to the right or to the left. The subject holds in each hand a telegraph key. He is instructed to press the key on the side toward which he is tipped the moment he knows which side he is being tipped to. The moment the platform starts to tip an electric circuit is opened and the moment he presses the correct key the circuit is closed. The time elapsing between the opening and closing of the circuit is measured by a chronoscopic device by means of which the average reaction time may be computed in thousandths of seconds. In connection with this test, it is of interest to note its correlation with results obtained by the Bárány chair test. Apparently there is no correlation whatever between the two. Repeated cases who have shown no nystagmus reaction or past pointing to the Bárány tests have shown without exception a perfectly normal or better than normal equilibrium reaction time. This should demonstrate conclusively the fault of the Bárány test. It was intended for clinical diagnostic use and not for use in recruiting aviators. It serves the purpose of the former, but emphatically does not serve that of the latter.

As far as equilibrium is concerned, all that we should demand of an aviator is that he perceive the changes being made in the planes occupied by the axes of his machine and that he react properly and quickly enough to these changes. It can now be said with the utmost emphasis that the Bárány chair does not test this function. It should matter little what the conditions of a man's labyrinth is or how long his nystagmus lasts, or does not last, provided he has a sense of equilibrium. There are so many excellent fliers who react improperly or not at all to the Bárány test that whatever is said in support of its value as a recruiting instrument ought not now to be

taken seriously. The test here described does determine whether the man can perceive a tip, whether he perceives correctly the direction of the tip, and how long it takes him to react properly to the tip. Whether it will prove to be of value in recruiting aviators remains to be seen. It was not in use before the group of 74 men in question were transferred from the ground school. Those who have been tested by it have not yet done enough flying to demonstrate its value or its worthlessness.

Test No. 9 is merely an ergographic tracing. It has been used with the hope that it would give some clew to the amount of persistence or perseverance, or better the "stick-to-itiveness," that one possesses.

The curves vary widely with different men, some producing a curve falling gradually and uniformly with the increasing muscular fatigue, which shows that they have done the best they could as long as they could, while others produce an erratically rising and falling curve showing perhaps their tendency to undue discouragement or a lack of great persistence.

Test No. 10 is an intelligence test. It is done with the Troland-Pressy machine which was designed for use in intelligence measurements. In operating it the subject must learn a set of combinations or sequences to be followed in the pressing of two keys, which if correctly followed will result in his lighting an incandescent lamp each time he presses a key. His errors are counted automatically and noted, together with the time spent on each trial, there being the same number of successful presses before each trial is completed. By noting his time and number of errors for each trial his rate of improvement and accordingly his rapidity in learning are determined, which should express, in some measure, his intelligence.

At the time of this writing it is impossible to give the comparison with flying records on tests 5, 8, 9, and 10 for the reason that they have but lately been ready for use and the men tested with them have not yet been transferred from the ground school to the flying camps, or have not done a sufficient amount of flying.

From information derived from the reports made by the flying instructors the pupils have been grouped into three classes, as follows: (1) Those that have demonstrated marked ability as fliers; (2) those of average ability; (3) those that have shown very poor ability or have been regarded as failures by their instructors.

The report filled out by the flight instructors has the form shown:

FLYING REPORT.

Name_____ Date_____

Total flying time to date of report_____ _____minutes.
Time on dual before first solo_____ _____minutes.

REPORT BY STUDENT'S DUAL INSTRUCTOR.

Name of instructor_____

Student as learner_____ ( ) Fast. ( ) Average. ( ) Slow.

Flying aptitude on completing dual_____ ( ) Good. ( ) Average. ( ) Poor.

Temperament_____ ( ) Cool. ( ) Average. ( ) Nervous. ( ) Easily discouraged.

Judgment at critical moments_____ ( ) Good. ( ) Average. ( ) Poor.

Sense of balance and direction_____ ( ) Good. ( ) Average. ( ) Poor.

Tendency on turns_____ ( ) Too flat. ( ) Over bank. ( ) Average. ( ) Irregular.

Judgment on landings_____ ( ) Good. ( ) Average. ( ) Poor.

Control_____ ( ) Delicate. ( ) Stiff.

REPORT OF DIVISION COMMANDER (JUDGING ESPECIALLY BY SOLO PERFORMANCE).

Responsible for damage to machine_____ ( ) Slight. ( ) Severe. ( ) Total wreck.

Effect on pupil of crash or scare_____ ( ) Negligible. ( ) Pronounced.

Student_____ ( ) Appears to enjoy flying. ( ) Rather indifferent to flying. ( ) Sticks to it though flying appears distasteful.

Remarks:

_____

_____

_____

_____;

Squadron Commander.

The following table shows the test performances of all men in the group who have proved to be excellent flyers. It is to be noted that some of the items are left blank. This is a result of technical difficulties which arose from time to time, preventing the completion of all the tests in the cases of some of the men.

In test 6, the pictures were graded A, B, or C according to accuracy, grade A representing the most accurate.

In test 7, 0 represents no evidence of fear of flying, + represents fear, and ± represents doubtful cases.

Table I.

Group I.	Test 1.					Test 2.				Test 3.	Test 4.	Test 5.	Test 6.		Test 7.
	Change in average rate of addition (seconds).	Time to previous rate (seconds).	Change in respiratory rate.	Time to previous rate.	Distortion.	Change in pulse rate.	Average visual reaction time.	Average auditory reaction time.	Average tactual reaction time.	Coordination, rate per minute.	Average time for reversed words—Number of mistakes.	Average error in centimeters.	Picture I.	Picture II.	Fear of flying.
NAME.															
O. T.	1.13	0	6.6	4.3	0	...	0.192	0.131	0.150	360	0.70 0	...	B	A	0
E. B. S.	0.39	3.2	0	0	0	6	.344	.434	.204	306	.55 0	...	C	B	0
E. P.	0.59	3.4	0	0	0	14	.280	.230	.185	327	.20 0	...	C	C	0
R. S. A.	.....	....	.....	.....	.....	.....	.219	.149	.270	....	.....	.....	.....	.....	...
L. J. B.	0.66	1.5	6.8	3.3	0	6	.274	.240	.250	330	.22 2	...	C	C	0
N. M. K.	0.62	0	0	0	0	12	.340	.264	.164	278	1.61 0	...	A	A	+
K. B. O.	0.15	0	3	5.6	+	4	.188	.124	.124	352	.14 0	...	A	B	0
R. A. B.	0.96	0	0	0	0	...	.211	.223	.204	255	.....	.....	.....	.....	0
L. L.	0.21	0	0	0	0	0	.181	.222	.193	268	1.4 0	...	A	B	0
F. B.	0.66	4.3	9	4.3	+	6	.284	.128	.142	350	.....	....	A	A	0
O. E. L.	0.67	0	6	3.3	+	12	.145	.124	.136	370	.91 0	...	B	B	+
J. L. D.	1.03	2.0	0.6	3.3	0	12	.282	.210	.184	....	.8 2	.....	.....	.....	±
W. K. B.	−0.72	0	0	0	+	6	.304	.292	.240	....	1.0 0	...	C	C	0
E. M. C.	−2.08	0	0	0	+	8	.200	.122	.195	....	.....	.....	.....	.....	...
J. C. N.	0.39	4.9	0	0	0	6	.180	.112	.195	334	.66 1	...	A	A	0
P. H. P.	−0.50	0	3	5.1	0	2	.348	.280	.268	285	1.1 0	...	A	C	0
C. H. S.	0.92	0	0	0	0	8	.176	.201	.102	321	1.66 1	...	C	C	0
E. B. L.	0.88	6.8	0	0	0	12	.208	.165	.176	288	1.8 1	...	B	C	0
G. G.	−1.59	0	3	5.3	0	10	.308	.228	.204	348	1.1 0	...	A	A	±
W. H. G.	0.28	4.5	0	0	0	8	.325	.253	.165	360	1.36 0	...	C	A	±
I. P.	0.76	0	0	0	+	6	.196	.164	.108	168	1.22 1	.....	.....	.....	0
H. N. S.	0.21	0	0	0	0	6	.220	.176	.156	420	.4 2	...	B	A	0
Z. H. P.	0.01	0	0	0	0	4	.221	.132	.232	293	.65 1	...	C	C	0

The following table shows the test performances of all men in the group who have proved to be very poor flyers, or failures, or extremely slow in learning to fly:

Table II.

	Test 1.					Test 2.				Test 3.	Test 4.	Test 5.	Test 6.		Test 7.
Group III.	Change in average rate of addition (seconds).	Time to previous rate (seconds).	Change in respiratory rate.	Time to previous rate.	Distortion.	Change in pulse rate.	Average visual reaction time.	Average auditory reaction time.	Average tactual reaction time.	Coordination, rate per minute.	Average time for reversed words—Number of mistakes.	Average error in centimeters.	Picture I.	Picture II.	Fear of flying.
NAME.															
J. L. G.	1.79	10.5	0.6	6.0	0	6	.340	.270	.216	400	1.66 / 1	...	C	C	+
W. H.	.45	5.0	3	1.0	+	6	.236	.173	.180	268	1.06 / 1	...	C	A	0
C. B. D.	2.66	11.4	2.0	5.6	+	6	.243	.241	.206	435	.26 / 2	...	...	...	±
H. A. M.	0.1	0	3	2.6	0	16	.247	.204	.242	310	.....	.....	...	...	+
E. H.	1.62	9.2	2	4.3	+	12	.146	.113	.135	325	.25 / 0	...	B	A	+
E. J. B.	.....	.....	.....	.....	.....	...	.240	.235	.233	288	.....	.....	...	...	...
R. C. C.	3.10	5.8	18	1.7	+	28	.193	.142	.195	451	.....	.....	...	...	+
C. N.	2.1	.8	6	1.2	+	24	.304	.316	.208	347	.05 / 4	...	C	B	+
G. L. R.	2.53	6.7	10.2	5.4	+	10	.191	.273	.226	335	.....	.....	...	...	...
F. C. S.	.35	4.1	3.0	5.6	0	24	.252	.227	.230	327	2.12 / 0	...	C	C	+
P. E. S.	.88	3.6	4.4	3.8	+	12	.224	.220	.164	300	.11 / 0	...	...	...	0

Table III is derived from the data in Table I. It gives the distribution of men in Group I (best flyers) according to their test scores. Arbitrary limits in the test scores have been used for this distribution into the three classes for every test.

It is noted that 63 per cent of all men in Group I made good scores in test 1 and that zero per cent made poor scores. Tests 3, 4 and 6 show a negative correlation with flying ability, evidencing their lack of value as they have been used.

Table III.

Group I, 23 men.	Number good in tests.	Per cent good.	Number average in tests.	Per cent average.	Number poor in tests.	Per cent poor.
Test No. 1	14	63	8	37	0	0
Test No. 2	12	52	5	22	6	26
Test No. 3	6	31	6	31	7	38
Test No. 4	2	10	8	42	9	48
Test No. 6	4	22	14	50	5	28
Test No. 7	16	76	3	14	2	10

Table IV gives the distribution of men in Group II (average flyers) according to their test scores.

Table IV.

Group II, 40 men.	Number good in tests.	Per cent good.	Number average in tests.	Per cent average.	Number poor in tests.	Per cent poor.
Test No. 1	15	37	18	46	7	17
Test No. 2	23	57	12	30	5	13
Test No. 3	12	33	15	42	9	25
Test No. 4	10	32	14	46	7	22
Test No. 6	11	33	16	47	7	20
Test No. 7	12	40	13	50	3	10

Table V is derived from the data in Table II. It gives the distribution of men in Group III (poorest flyers) according to their test scores.

Here again may be noted the close correlation shown by test 1. Only one man in Group III made a good score on this test. Test 2 is seen to be more disappointing here than in Table III. Test 6 seems here to be more valuable than it does in Table III, and test 7 corroborates the testimony given in Table III.

Table V.

Group III, 11 men.	Number good in tests.	Per cent good.	Number average in tests.	Per cent average.	Number poor in tests.	Per cent poor.
Test No. 1	1	10	0	0	9	90
Test No. 2	3	27	6	54	2	19
Test No. 3	3	27	6	54	2	19
Test No. 4	2	28	0	0	5	72
Test No. 6	0	0	3	60	2	40
Test No. 7	2	22	1	12	6	66

In Table VI the 25 men standing highest on each test are distributed according to their flying ability, the per cent of the total number of 25 being given for each of the three groups, in the case of each test.

In Table VII the 25 men standing lowest on each test are distributed as in Table VI.

Table VI.

Best 25 men in tests No.—	Number good flyers.	Per cent good.	Number average flyers.	Per cent average.	Number poor flyers.	Per cent poor.
1	13	52	11	44	1	4
2	11	44	13	52	1	4
3	7	28	14	56	4	16
4	9	36	12	48	4	16
6	9	36	16	64	0	0
7	13	52	6	24	3	12

Table VII.

Worst 25 men in tests No.—	Number good flyers.	Per cent good.	Number average flyers.	Per cent average.	Number poor flyers.	Per cent poor.
1	0	0	17	68	8	32
2	3	12	15	60	7	28
3	6	24	16	64	3	12
4	5	20	17	68	3	12
6	6	24	16	64	3	12
7	5	20	13	52	7	28

Of course, a study based upon only 74 men can not be of much value but, on the basis of the figures derived from this study, let us see how the use of these tests will affect the efficiency of our naval flying corps.

Of the 74 men in question, 23 (31 per cent) are aviators of excellent ability; 40 (54 per cent) are aviators of average ability, and 11 (15 per cent) have been considered very poor flyers or failures.

By the use of test 1, in accepting 74 students, by rejecting all men whose scores fell in the lower third of the three-score levels, it may be seen by Table V that 90 per cent of the poor flyers would be eliminated; by Table IV that 17 per cent of the average flyers would be eliminated, and by Table III that 0 per cent of the good flyers would be eliminated. Twenty-one per cent of all men applying would be eliminated. Therefore, it would require 93 applicants to supply the quota of 74 qualified men. Assuming that of all healthy men who want to become aviators, 31 per cent will become excellent aviators, 54 per cent aviators of average ability, and 15 per cent failures; of

the 93 men, 29 would be excellent material, 50 would be average material, and 14 poor material. Since none of the excellent material would be rejected, 29 excellent men would be accepted; 17 per cent of the 50 average men would be rejected, leaving 42 such men; 90 per cent of the 14 poor men would be rejected, leaving 2 such men.

The table below shows the difference in the ratio of the three classes to each other that would be affected by the use of the test as proposed:

	Number excellent.	Per cent.	Number average.	Per cent.	Number poor.	Per cent.
Without test.....	23	31	40	54	11	15
With test.....	29	39	42	57	2	3

On the basis of this study test 2 would be of no benefit since by its use more good men than poor men would be rejected. In this connection, it may be stated that the test has lately been modified to include only visual reactions and has been changed from a simple reaction time measurement to a choice reaction time measurement. This modification has been made with the hope that it will now produce more encouraging figures.

Test 3 appears to be of no value whatever.

By the use of test 4, 72 per cent of the poor flyers and 48 per cent of the good flyers would be eliminated. But since the good flyers outnumber the poor flyers two to one, there would be an equal number of both classes eliminated. Approximately the same condition holds for test 6.

The evidence seems to indicate a definite value for test 7. By rejecting all men showing a definite fear of the air, on the basis of this test, the ratio of the sizes of the three classes to each other would be made distinctly more desirable. Since 18 per cent of all men would be eliminated by this test, 90 men would be required to make up the quota of 74. Of the 90 men 27 would be excellent material, 49 average material and 14 poor material. Ten per cent of the good men would be rejected, leaving 24; 10 per cent of the average men would be rejected, leaving 45; 66 per cent of the poor men would be rejected, leaving 5.

The ratio change brought about would be thus:

	Number excellent.	Per cent.	Number average.	Per cent.	Number poor.	Per cent.
Without test.....	23	31	40	54	11	15
With test.....	24	33	45	60	5	7

It ought not to be hoped, even, that any test or set of tests will ever be developed to a degree of perfection that will detect invariably poor aviation material. Nevertheless, I do believe that from the value already demonstrated in test 7, and especially in test 1, that tests can be devised which if used properly will result in a distinct improvement in the efficiency of our flying corps.

Results have not yet come in from the flying camps to compare with tests 5, 8, 9, and 10.

In the meantime, tests 3, 4, and 6 being abandoned, more attention can be paid to the improvement of technique in tests 1 and 7 and the modification mentioned for test 2.

No one test will ever suffice, since one test can only measure one function, and certainly there is a complexity of functions involved in the making of a successful aviator.

So little flying was being done in this country before our entrance into the war, that we looked upon the aviator as a rare curiosity, a superhuman being, some one to be held in awe and reverence. We thought that to become a successful aeronaut was something that could be attained only by the one in a thousand, the true hero, endowed with almost miraculous skill and daring. It was because this view was generally held, perhaps, that we adopted such a high set of physical standards in our selection of aviation candidates.

Experience has taught us, however, that almost any young man with a reasonable amount of common sense, the usual amount of "nerve" possessed by most young Americans, and a keen desire to be an aviator, can realize his ambitions and learn to be a perfectly good flyer in a very few hours.

It is indeed questionable whether a great deal more actual skill is required in learning to fly than in learning to drive an automobile. We are coming to believe that, after all, the most important quality that determines one's success as a flyer is that of "nerve." Everyone realizes that flying is a dangerous occupation. The flight pupils realize this as much as anyone does, and those that can best forget it, and can feel perfectly at ease in the aeroplane are invariably the ones who learn the quickest and who become most successful.

The results obtained by these tests bear out thoroughly the truth of these contentions. The test which proved to be most valuable is the one that measures composure under exciting influences. The next best test is the one that often detects a tendency to fear of the air. I firmly believe that the technique can be perfected in both of these tests to an extent that will make them even more valuable than they already have shown themselves to be. The blood pressure is known to be the most reliable index of the extent of emotion, but as yet no means have been devised for giving us an accurate and continuous record of blood-pressure changes. The height of the pulse tracings.

however, gives us a rough idea of its changes. The changes in pulse rate are, too, a valuable index, and undoubtedly the concentration of thought is also. This last, it was shown in the description of test 1, can be quite simply and probably very reliably measured.

There is great room for improvement in test 7. The selection of the words was made after a perusal of the entire dictionary. During this task it is quite probable that many words were overlooked which would suit the purpose much better than some that were selected. There is a great chance for error in this test in the analysis of the responses. Only after the experience obtained by the analysis of hundreds of sets of responses should the examiner place much confidence in the conclusions he comes to through the use of this test. Below are given the responses, with the time for each, of two typical cases. Those given in set 1 were by a student who became a good flyer. Those given in set 2 were by a student who was given up by his instructors as a hopeless case. It is noted that in set 1 the time for the responses to the aviation words does not total greater than that for the nonaviation words. In set 2 the time for the aviation words totals 17.6 seconds more than for the nonaviation words. The difference in the nature of the responses in the two sets is self-evident.

Set I.

	Suggestion.	Response.	Time.		Suggestion.	Response.	Time.
1	Cabbage	Stew	2.1	51	*Break*	Glass	2.0
2	*Wing*	Bird	1.0	52	*Scare*	Up	1.2
3	*Death*	Murder	1.1	53	Candy	Kid	1.3
4	Fancy	Full	1.8	54	Queen	Lady	1.8
5	Coffee	Tea	2.0	55	*Frighten*	Scared	1.2
6	*Reckless*	Driver	1.9	56	*Fear*	Fright	1.1
7	*Jump*	Over	1.2	57	Daughter	Son	1.4
8	Garden	Flowers	1.3	58	Ham	Eggs	1.8
9	Kitchen	Canary	1.5	59	*Careless*	Useless	1.7
10	*Earth*	Round	1.3	60	*Propeller*	Blade	1.0
11	*Trouble*	Sick	1.2	61	Index	Finger	2.0
12	Permit	Me	1.8	62	Animal	Elephant	1.5
13	Paper	White	2.0	63	*Landing*	Made	1.5
14	*Danger*	Break	2.0	64	*Upside down*	Upside up	2.1
15	*Drop*	Down	1.8	65	Fat	Lean	2.2
16	Grammar	School	2.1	66	Girl	Sweetheart	2.8
17	Janitor	Furnace	3.0	67	*Immediate*	At once	1.0
18	*Fall*	Winter	3.8	68	*Control*	Airship	1.2
19	*Smash*	Up	1.1	69	Absorb	Water	1.3
20	Weed	Flower	1.1	70	Include	Exclude	2.1
21	Dinner	Supper	1.3	71	*Afraid*	Scared	1.0
22	*Kill*	Dead	0.8	72	*Flying*	Straight	1.2
23	*Life*	Live	1.0	73	Label	Cover	1.8
24	Elephant	Animal	2.2	74	*High*	Low	1.3
25	Orange	Fruit	1.3	75	*Die*	Dead	1.2
26	*Fog*	Dark	1.8	76	Eat	Food	1.0
27	*Turnover*	In bed	1.1	77	Tennis	Ball	0.9
28	Tube	Stone	2.3	78	Height	Low	0.5
29	Lady	Love	1.5	79	*Aeroplane*	Fly	1.3
30	*Ground*	Hard	1.4	80	*Attack*	Defense	1.1
31	*Insecure*	Unsafe	1.6	81	Shoe	Wear	1.3
32	Table	Round	1.9	82	Basket	Eggs	1.6
33	Thread	White	1.8	83	*Drown*	Water	1.4
34	*Loose*	Watch	1.7	84	*Dizzy*	Whirl	1.2
35	*Fly*	Air	1.5	85	Pencil	Paper	2.0
36	Cigar	Smoke	3.2	86	Bread	White	1.6
37	Oyster	Clam	2.0	87	*Stop*	Listen	1.4
38	*Lose*	Money	1.4	88	*Cloud*	Rain	1.1
39	*Motor*	Car	1.0	89	Beans	Grow	2.3
40	Napkin	Ring	2.1	90	Waldorf	Eat	1.6
41	Hair	Tonic	1.3	91	*Careful*	Lookout	1.8
42	*Crash*	Smash	1.2	92	*Spill*	Milk	2.0
43	*Balance*	Lose	2.1	93	Paste	Glue	2.5
44	Jewel	Lose	3.0	94	Beer	Drink	1.5
45	Baby	Young	1.4	95	*Altitude*	Height	1.2
46	*Tip*	Over	0.9	96	*Worry*	Care	0.8
47	*Quick*	Slow	1.3	97	Stove	Heat	1.4
48	Odor	Smell	1.0	98	Cloth	White	1.7
49	Umpire	Ball game	1.8	99	*Daring*	Afraid	2.4
50	Horse	Cow	2.2	100	Overcoat	Wear	1.0

Total time for aviation words..... 70.2 seconds.
Total time for other words..... 91.2 seconds.

Minus..... 21.0 seconds.

Set II.

	Suggestion.	Response.	Time.		Suggestion.	Response.	Time.
1	Cabbage	Lettuce	1.4	51	*Break*	Smash	1.6
2	*Wing*	Bird	1.3	52	*Scare*	Fear	1.1
3	*Death*	Bury	1.5	53	Candy	Soda	1.2
4	Fancy	Free	1.1	54	Queen	May	1.0
5	Coffee	Chocolate	1.2	55	*Frighten*	Scare	1.3
6	*Reckless*	Daring	1.6	56	*Fear*	Death	1.7
7	*Jump*	Back	1.2	57	Daughter	Son	1.1
8	Garden	Walk	3.0	58	Ham	Eggs	1.4
9	Kitchen	Stove	1.0	59	*Careless*	Reckless	1.2
10	*Earth*	Ground	1.1	60	*Propeller*	Blade	1.4
11	*Trouble*	Care	1.9	61	Index	Inventory	2.1
12	Permit	Allow	1.2	62	Animal	Creature	1.1
13	Paper	Pencil	1.0	63	*Landing*	Water	1.0
14	*Danger*	Death	1.1	64	*Upside down*	Loop	2.1
15	*Drop*	Back	1.0	65	Fat	Thin	1.0
16	Grammar	School	1.0	66	Girl	Woman	1.2
17	Janitor	Housekeeper	2.4	67	*Immediate*	At once	1.4
18	*Fall*	Forward	2.4	68	*Control*	Rudder	1.3
19	*Smash*	Nose-dive	2.0	69	Absorb	Absorbent	1.4
20	Weed	Vegetable	1.2	70	Include	Conclude	1.2
21	Dinner	Supper	1.1	71	*Afraid*	Fear	1.2
22	*Kill*	Drop	1.4	72	*Flying*	Brave	1.1
23	*Life*	Death	2.0	73	Label	Ticket	1.0
24	Elephant	Rhinoceros	1.2	74	*High*	Low	1.8
25	Orange	Lemon	1.0	75	*Die*	Death	2.0
26	*Fog*	Mist	1.3	76	Eat	Thin	1.1
27	*Turnover*	Fall down	2.4	77	Tennis	Golf	1.3
28	Tube	Pipe	1.0	78	*Height*	Depth	1.0
29	Lady	Man	1.2	79	*Aeroplane*	Flying boat	2.1
30	*Ground*	Sail	1.1	80	*Attack*	Fierce	1.4
31	*Insecure*	Secure	1.4	81	Shoe	Foot	1.0
32	Table	Leg	1.1	82	Basket	Ball	1.1
33	Thread	Silk	2.0	83	*Drown*	Swim	1.0
34	*Loose*	Tight	1.6	84	*Dizzy*	Brave	1.1
35	*Fly*	Fall	2.2	85	Pencil	Pen	1.0
36	Cigar	Cigarette	1.0	86	Bread	Eat	1.1
37	Oyster	Cocktail	1.2	87	*Stop*	Quick	1.4
38	*Lose*	Find	1.0	88	*Cloud*	Roll	1.2
39	*Motor*	Aeroplane	1.4	89	Beans	Peas	1.1
40	Napkin	Tablecloth	1.2	90	Waldorf	Astoria	1.0
41	Hair	Breadth	1.0	91	*Careful*	Reckless	1.8
42	*Crash*	Fall	1.0	92	*Spill*	Fall	1.4
43	*Balance*	Fall	1.0	93	Paste	Glue	1.2
44	Jewel	Ruby	1.4	94	Beer	Ale	1.0
45	Baby	Boy	1.1	95	*Altitude*	High	3.1
46	*Tip*	Over	3.2	96	*Worry*	Reckless	1.0
47	*Quick*	Slow	1.4	97	Stove	Pipe	1.0
48	Odor	Smell	1.0	98	Cloth	Table	1.1
49	Umpire	Baseball	1.1	99	*Daring*	Brave	2.0
50	Horse	Run	1.0	100	Overcoat	Hat	1.0

Total time for aviation words..... 78.4 seconds.
Total time for other words..... 60.8 seconds.

Plus..... 17.6 seconds.

In conclusion, I believe that more medical officers should be working on this problem. It is certainly a new field of research and one that offers a world of work for anyone who cares to investigate it.

What has been done already is merely a beginning in the attack on the problem before us and has yielded us a few very valuable clues to work on.

The pendulum at present is situated on the crest of the physical side of the problem, much to the detriment of our flying corps. It would indeed be equally unfortunate should the pendulum swing to the crests of the things that have been treated here. These tests, as soon as we have standardized those of proven value, should be used to supplement physical examinations.

Our physical standards should be lowered. The aviator's job is an ideal one for the flat-footed man, for where would he have to do less walking? Aviation is an ideal field for the deaf and the near-deaf man, for where would he have to do less hearing? A half inch difference in chest expansion will not decide the fate of the ambitious aviation student, nor will a difference of 2/20 or 10/20 in vision.

The physical standards for our aviators should, of course, be as high as those for other branches of the service, but no higher; in fact, as has been pointed out, there are several defects which, while constituting a definite handicap to a man in other branches of the service, would affect in no way his ability as an aviator.

PLATES ILLUSTRATING THE PATHOLOGICAL EFFECTS PRODUCED BY SOME OF THE BETTER KNOWN POISON GASES USED BY THE GERMANS.[1]

Prepared under the direction of the Bureau of Medicine and Surgery
By Assistant Surgeon G. M. MACKENZIE, U. S. N. R. F.,
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Washington, D. C.

[1] Valuable work on the effects of chlorine and other gases employed by the Germans is being done by Prof. Yandell Henderson, of Yale, and his associates. The results of his researches being extremely confidential, no printed report can be expected before the end of the war. Medical officers of the Army and Navy interested in this subject should apply to Dr. Henderson for information, as he has expressed the greatest eagerness to render them every assistance.

PLATE I.

Edema of lungs, emphysema and serous exudate and froth in trachea of a dog exposed for 30 minutes to a 0.59 milligram-liter concentration of superpalite, death occurring in 72 hours. The appearances are typical of those produced by chlorine, phosgene, and other exciters of lung edema.

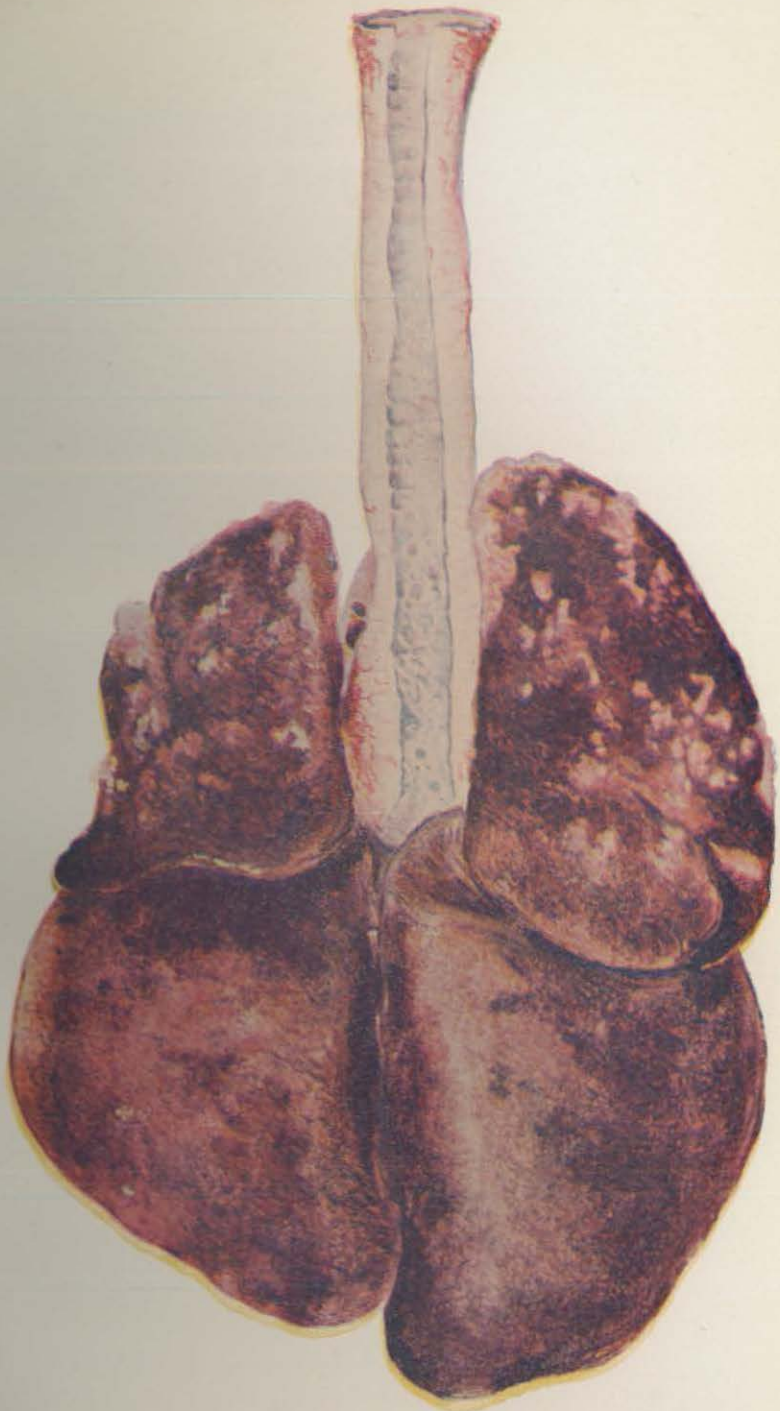


PLATE II.

A. Interior of left ventricle of a dog dying 23 hours after 30-minute exposure to a 0.21 milligram-liter concentration of superpalite. Subendocardial hemorrhages are shown.

B. Section of liver of a dog dying 20 hours after 30-minute exposure to a 200 parts–1,000,000 (by volume) concentration of arsine. Well-marked jaundice.

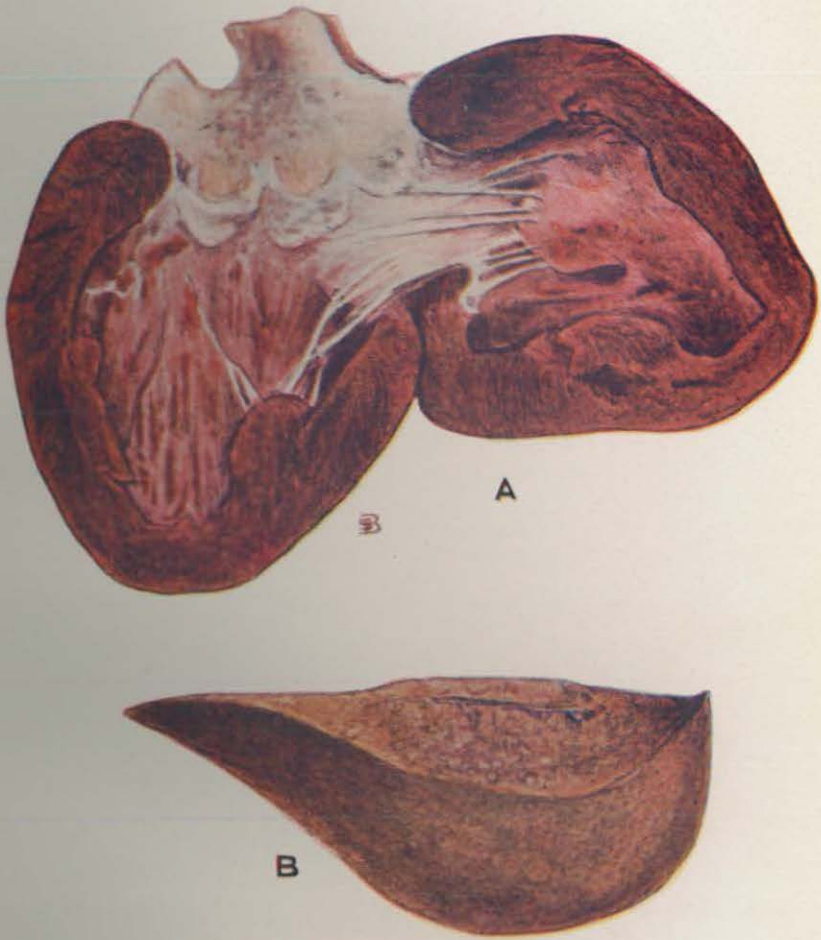

A
B

PLATE III.

A. Trachea and larynx of a dog dying 48 hours after 30-minute exposure to a 0.13 milligram-liter concentration of dichlorethylsulphide ("Mustard gas"). Congestion and edema of glottis and epiglottis and acute membranous tracheitis are beautifully shown.

B. Section of lung of a dog with atelectasis and patches of focal pneumonia following 30-minute exposure to 0.056 milligram-liter concentration of dichlorethylsulphide. Death occurred 72 hours after gassing.

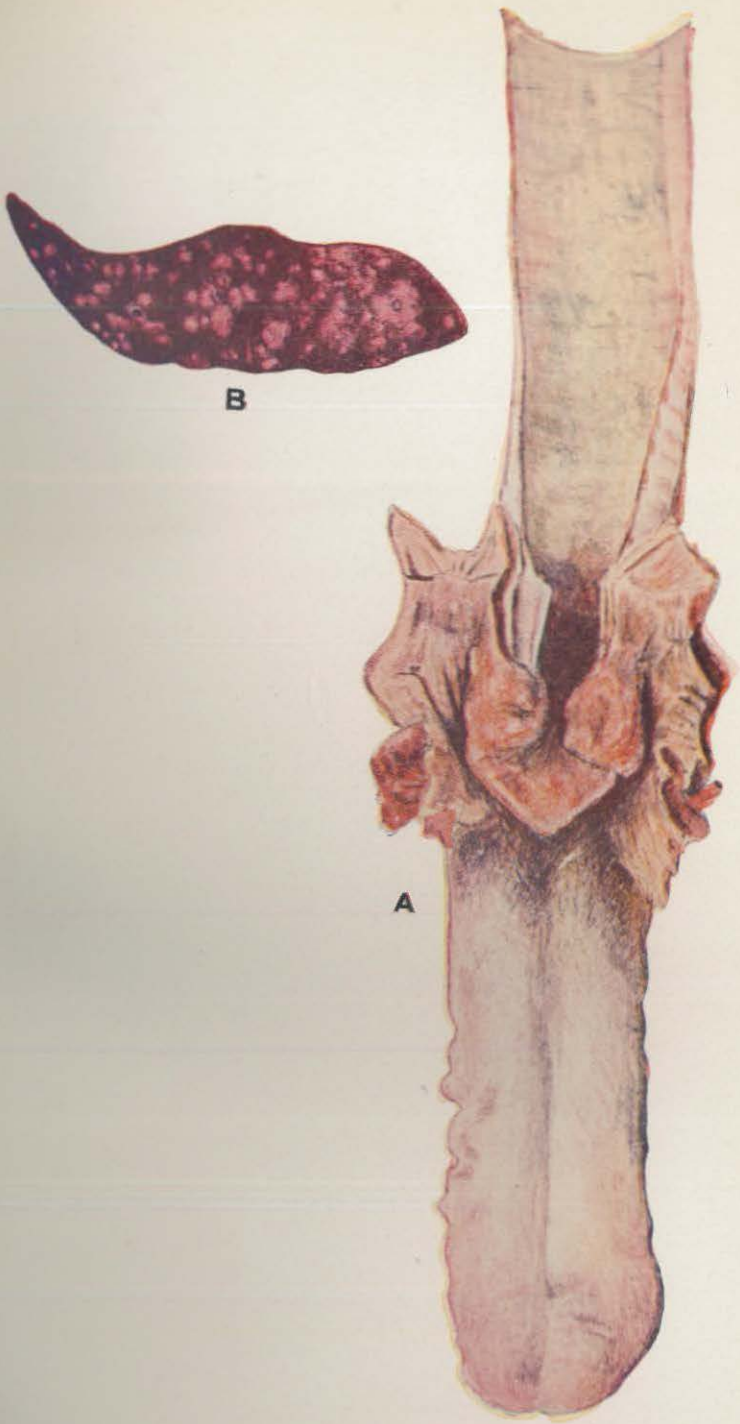
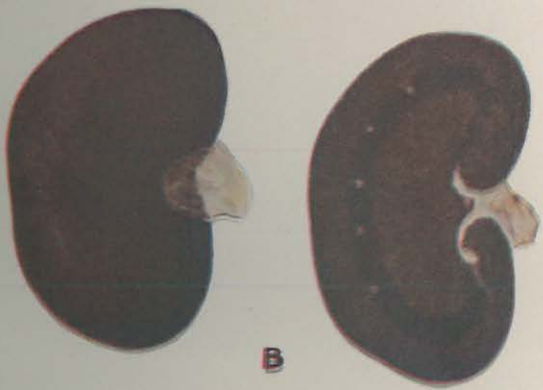

B
A

PLATE IV.

A. External surface and section of kidney of a dog dying 20 hours after 30-minute exposures to 200 parts—1,000,000 (by volume) concentration of arsine. The staining is due to methemoglobin, which appears both in the cut section and on the external surface from which the capsule has been stripped. Hemorrhages and swelling of the cortex are also noticeable.

B. The staining is also by methemoglobin and is much more intense, due to a higher concentration of the gas, arsine, 300 parts—1,000,000 (by volume). Death occurred 2 hours sooner than in the case of *A*.

A

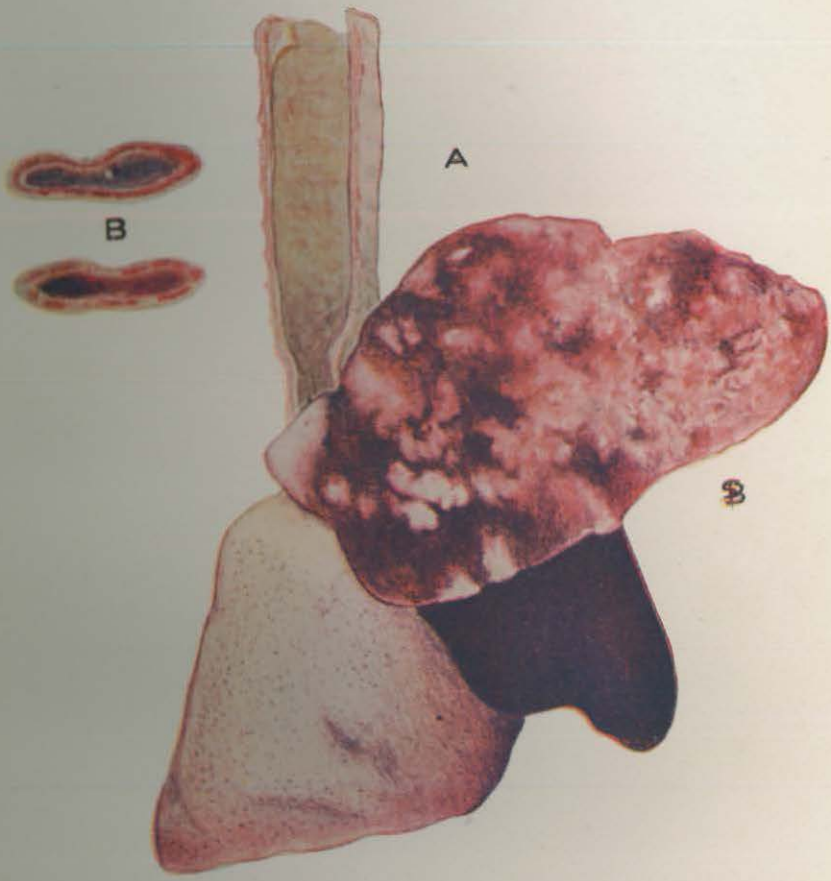


B

PLATE V.

A. Trachea and lung of a dog dying 48 hours after 30-minute exposure to 0.27 milligram-liter concentration of dichlorethylsulphide. Membranous tracheitis and complete atelectasis of middle lobe are conspicuous. Patches of emphysema and collapse are seen in the upper lobe. The lower lobe is well aerated.

B. Hemorrhages in the cortex of suprarenals of a dog dying 96 hours after 30-minute exposure to 0.09 milligram-liter concentration of dichlorethylsulphide.


A
B
B

THE ORGANIZATION AND EQUIPMENT OF NAVY HOSPITAL UNITS.

By T. W. Richards, Medical Director, United States Navy.

While it is now generally known throughout the naval service that a certain number of organizations variously known as "Navy base hospital units" and "Navy station hospital units" are available for service or have actually been assigned to duty, there appears to be widespread confusion among members of the Medical Corps itself regarding the precise status of these units and the circumstances under which they were called into being. It is the purpose of this paper, therefore, to set forth in some detail the basic principles upon which these medical groups have been constituted, and particularly to indicate the rôle played by the American Red Cross in their organization and equipment.

Although navies in general, our own included, are commonly said to be always on a "war footing," and while this is true in the sense that all or a certain portion of the fighting units could, at any given moment, engage in battle, the statement obviously omits from consideration the well-known fact that enormous expansion of the personnel will occur coincident with or immediately subsequent to the outbreak of hostilities. It is furthermore apparent that such expansion must take place with great rapidity, since active naval operations may and often do begin immediately, whereas extensive military operations, so far as concerns the United States, might be appreciably deferred pending the transportation of large bodies of men overseas. Step by step with enlistments in the naval service come demands for hospital facilities and unless these have been prepared in excess before the outbreak of war great difficulty will be encountered in keeping pace with the growing demands. Under peace conditions our naval hospital facilities have been necessarily limited to current needs since public opinion in this country, as reflected in Congress, has never countenanced the expenditures which would be involved by hospital construction and equipment in excess of such requirements. It was foreseen, of course, that at any time upon the outbreak of war Government funds would be available in ample amount and that the problem which would then confront the Medical Departments of the Army and Navy would be, not lack of money, but inability to rapidly expend it. As a matter of fact, exactly this condition prevailed last spring and summer when it was found that the available markets of the world would not immediately suffice to procure in sufficient amount medical and surgical equipments which might have been urgently needed, although fortunately the international situation was such that opportunity was afforded to meet the more pressing demands as they arose.

Of the many who foresaw the situation outlined above and did their part to meet it there was no one, perhaps, who brought greater breadth of vision and foresight to bear on the peculiar combination of circumstances constituting the military hospital problem as a whole than Colonel Jefferson R. Kean, Medical Corps, United States Army, who in the summer of 1915 was officially detailed as Director General of Military Relief, American Red Cross. Realizing fully prospective needs he conceived the idea[1] that, through the agency of this society it might be possible to build up medico-military organizations at many of our larger civil hospitals, each constituting a group of medical men of the highest standing, together with nurses and attendants, all of whom were known to each other, personally and professionally, and who were accustomed to working along identical lines. Obviously these features would not only tend to promote a strong local esprit de corps without which the "units" would tend to disintegrate in peace times, but would permit successful teamwork immediately if the organizations were called upon for service in the event of war; both these advantages would have been appreciably lacking in large heterogeneous groups, drawn from various communities and animated to some extent by different professional standards. It was a brilliant conception and in the end met with extraordinary success, due largely to the tact and indomitable perseverance of its originator, as the difficulties encountered in carrying through this plan seemed at first almost insuperable, for it should be borne in mind that while the American Red Cross is now a stupendous organization with a membership numbering, perhaps, some 22,000,000 and a fund of over $100,000,000 (sufficient, Mr. H. P. Davidson, chairman of the War Council, informs the public, "to start with"), this society in 1915 was an infant in arms, its membership not in excess of 27,000, and no funds whatever available to provide equipment for such elaborate organizations as Col. Kean had in view. Moreover, to the general public, including the medical profession at large, the possibility that the United States might become involved in the present war, or any war for that matter, appeared extremely remote, and efforts to enroll active sympathy or financial support naturally encountered great inertia. Col. Kean's first efforts, therefore, were necessarily of an educational nature, for he had to convince many people that the time, money and labor to be expended were really worth while, and, in fact, it was only necessary to present this matter in its proper light to awaken the national en-

[1] I believe that Col. Kean himself credits the original conception of homogeneous units to Dr. George W. Crile (now major, Medical Reserve Corps, United States Army, organizing director of Army base hospital No. 4), who, shortly after the outbreak of the war in Europe, had gone abroad at the head of a group of medical men and nurses from his own operating department in the Lakeside Hospital, Cleveland.

thusiasm and patriotism which the medical profession of this country has since so amply demonstrated. During the succeeding fall and winter the personnel for seven Army base hospital units was organized, more or less completely, on paper, these being located in the larger medical centers, including New York, Boston, Philadelphia, Chicago, and Cleveland, and after some further delay funds approximating $25,000 each were raised and appropriated for the purchase of equipment by the local Red Cross chapters in the cities concerned.

It should be understood, of course, that this movement met with the hearty approval of the Surgeons General of the Army and Navy, and upon nomination of the latter, I was assigned to duty in charge of the Bureau of Naval Affairs, American Red Cross, for the special purpose of organizing, along the same lines, five Navy base hospitals which the Surgeon General considered desirable. My connection, therefore, with this undertaking dates back to July, 1916, at which time no equipment for any of the base hospitals had been procured. As there was then a serious shortage of personnel at Red Cross headquarters the supervision of this work for both Army and Navy hospitals was temporarily turned over to me.

As originally constituted each Navy base hospital "unit"—the latter term including both personnel and equipment—was organized upon a normal basis of 250 beds, or half the capacity of the Army standard. It was realized that further expansion might become necessary—and such, indeed, has been the case—but it was believed that the question of suitable accommodations—housing—would prove a serious one and that a 250-bed hospital might be quickly established where one of twice that size could not be quartered. In this connection a great deal of time and thought was devoted to the consideration of tentage and portable buildings, in the hope that some practicable means could be found for providing quarters in advance, thus making the units complete and independent of local facilities. It was decided, however, that the expense in either case was, if not prohibitive, at least unjustifiable and that storage and transportation problems, already serious, would become acute.

In organizing one of these units the first and most important consideration was the selection and appointment of the director, since he, in turn, would nominate—though he could not appoint—his associates. To adequately comply with all requirements the director must not only personify the very highest mental, moral, and professional standards, but be himself a leader of men who could inspire enthusiasm and create a following; indeed, it is not too much to say that the entire future of this undertaking hinged upon the possession of those attributes.

Fortunately it was possible to enlist the support of just such individuals, men at the top of the ladder, whose success as practitioners

and administrators in civil life afforded a safe foundation for trust and confidence; that all such expectations have been or will be more than realized is shown by the record of units now in service. At first I had anticipated some difficulty in filling our quota owing to the fact that commissions in the Medical Reserve Corps of the Navy gave only the grade of assistant surgeon to all members of the unit while officers in the Army organizations were distributed in the several grades up to, and including, that of major. This condition no longer prevails, the two services now being on a par, but I am happy to relate that the former unfavorable status did not appreciably influence the attitude of a single individual.

In selecting the medical staffs of the various units the National Committee on Red Cross Medical Service proved of invaluable assistance. This committee consists of 56 members, including the Surgeons General of the Army, Navy, and Public Health Service, the Presidents of the American Medical Association, the Clinical College of Surgeons of North America, the Congress of American Physicians and Surgeons, the American Surgical Association, the American College of Surgeons, and some of the most distinguished members of the medical profession throughout the country at large, such men, for example, as Biggs, Billings, Chapin, Crile, Cushing, De Schweinitz, Finney, Flexner, Le Conte, Martin, Matas, Mayo, Ochsner, Thayer, Welch, and others of equal standing. In many cases we also received advice from local medical organizations; thus, the director of the Navy station hospital unit organized at Columbus, Ohio, was appointed upon the unanimous recommendation of the Academy of Medicine of that city. He was at that time an officer in the Medical Reserve Corps of the Army, but resigned to accept enrollment in the Naval Reserve Force, and such transfers from the Army to the Navy, or vice versa, were not uncommon, both Surgeons General approving such requests when clearly indicated by national interests. When the medical and surgical staff of a unit was completely organized in a manner acceptable to this office individual applications for examination and enrollment in the Naval Reserve Force were forwarded to the Navy Department in the customary manner and each member was given not only the usual mental, moral and professional examination, but was required to demonstrate his particular fitness for the special duties he was expected to perform within the unit. Of the large number of applicants whose papers passed through my hands only two failed to pass the Navy professional examinations; in these instances the candidates were fully qualified for enrollment for general service, but failed to meet the requirements as X-ray specialists.

One of the most important elements in these organizations was the nursing staff, and in this connection the National Committee on Red

Cross Nursing Service played a most important rôle. Long before the United States became involved in war this organization had enrolled nurses in large numbers, selected from the very best in their profession, and as the physical, mental, and professional qualifications for enrollment as a Red Cross nurse are based upon the standards required by the Army and Navy Medical Departments a great saving in time and labor was effected, because nurses so accepted could be afterwards enrolled in the Naval Reserve Force without further preliminaries. It should be understood, however, that the examination papers of all nurses so enrolled are submitted to a representative of the Surgeon General's Office for approval and in any case of doubt the candidate is rejected. As a matter of fact, however, the examinations required by the American Red Cross have resulted in the selection of a very able and competent body of women, and of the thousands already called into service by the Army and Navy few have failed to measure up to our physical and professional requirements. The demands upon the nursing profession in this war have already been severe and promise to be stupendous, so that special efforts are now being made by the American Red Cross to keep up the supply and anticipate the increasing needs of the Army and Navy. Practically speaking, therefore, the Red Cross nurses afford a valuable reserve upon which the Army and Navy can draw in time of need, but like all other individuals in these units the nurses must be actually enrolled in the Naval Reserve Force before being called upon for service and they are then exclusively under Navy control and discipline. Forty nurses were assigned to each base hospital, with 20 in reserve, and the chief nurse of each unit was detailed to a naval hospital for instruction and training in matters peculiar to her future duties in the service.

When the first naval units were organized it was deemed inexpedient to attempt the enrollment of hospital corpsmen and other enlisted personnel, as Col. Kean had experienced great difficulty in retaining qualified men for Army units in time of peace. Among the most necessary individuals, for example, are cooks and mess attendants, and men to fill these ratings were particularly hard to hold. Furthermore, I felt convinced that this portion of the complement could be readily recruited under the impetus of war, and later this proved to be the case. In this connection some interesting problems arose; for, to make these units complete in all respects and available for foreign service when called upon, it was necessary to have an enlisted personnel which would take over all duties usually performed at our naval hospitals by civil employees as well as by members of the Hospital Corps, a procedure which involved some of the strongest traditions of the Navy. All preliminary details, however, were taken up with the Bureau of Medicine and Surgery and through that office

with the Bureau of Navigation, obsolete customs were cast aside to meet war conditions, and the following complement was officially authorized, the men to be enrolled locally for the several units:

1 pay clerk.
1 commissary steward.
1 chief yeoman (man or woman).
4 yeomen, second and third class (men or women).
40 hospital apprentices, first and second class.
2 carpenter's mates, third class.
2 electricians (general), third class.
2 plumbers and fitters.
2 coxswains or machinist's mates, second class, for chauffeurs and mechanicians.
1 cook, first class.
4 cooks, second class.
8 cooks, third class or fourth class.
20 mess attendants.

In addition to the above, the Bureau of Medicine and Surgery arranged to assign the following experienced men:

1 pharmacist.
2 chief pharmacist's mates.
3 pharmacist's mates, first class.
4 pharmacist's mates, third class.

In May, 1917, enrollments were begun in the various ratings, the men being selected by the directors of the several units and sent to the local recruiting office for examination, and if qualified for enrollment in the Naval Reserve Force. No serious difficulty was experienced in filling the complements, and the men were immediately assigned to duty for a period of training; the hospital corpsmen were detailed to our naval hospitals or a special course of instruction was given to some of them in civil institutions, following the lines of our Hospital Corps training schools so far as practicable. Naturally this question of training presented serious difficulties and I had grave doubts as to its success, but a fine class of men had been enrolled, most of whom had a high-school education and in many cases a college degree, and the naval medical officers who had them under observation spoke most favorably of their application and progress. To promote this work, some of the nurses and medical officers of the units were themselves assigned to duty and, after becoming more or less familiar with Navy routine, they in turn assisted in the instruction of the hospital corpsmen.

For the equipment of the Army base hospitals Col. Kean naturally decided to follow the allowance table as set forth in the Manual for the Medical Department, United States Army, 1914. This was also used, to some extent, as a guide in purchasing equipment for Navy base hospitals, after considerable modification to meet the views of

the Surgeon General of the Navy, the quantities being in most instances reduced in accordance with our smaller bed capacity, although certain essential items (such as sterilizers) were not curtailed in size. In order to keep expenditures down to a minimum, it was merely intended that the original equipment, purchased by the Red Cross and stored ready for use, should be sufficient to enable the hospital to begin work and continue in operation until the Medical Department of the Army or Navy, as the case might be, could complete the outfit. Even with this limitation, it was soon found that the allowance table as given in the Manual required amplification, for at the time this book was issued no base hospitals existed in this country and the equipment called for was really that of a magnified field hospital—a hospital which could be packed up and moved at comparatively short notice. For example, cots were specified instead of beds and the surgical instruments and many other items called for were limited by the special containers designed for field service. Many items could only be obtained through the Medical Department or Quartermaster's Department of the Army, and as soon as the prospect of war became acute this source of supply was cut off. Furthermore, as local interest increased in the organization and equipment of certain units, additional funds became available, so that material amplification was both advisable and practicable. This purpose was also promoted by the desire of the directors and other members of these units for facilities somewhat commensurate with those they were accustomed to in civil life; they felt that they could not do good work with the original outfits, and this attitude was greatly stimulated by a demonstration which took place in Philadelphia in October, 1916.

In response to a general demand, voiced by the surgical profession of the country, Col. Kean arranged with the War Department to have one of the Army base hospitals mobilized and set up under canvas in Fairmount Park as an object lesson which would bring out the weak points of these organizations and at the same time demonstrate their utility. This was accordingly done; a complete unit was brought on from Cleveland, Ohio, by Major George W. Crile, M. R. C., United States Army, the director. The equipment was set up in place and the entire organization was, in fact, put upon an operating basis. As a result, however, of the numerous comments and criticisms of the equipment and the use of tentage a board, of which I was a member, was appointed for the consideration of these subjects, and in January, 1917, accompanied by three of my confrères, I visited most of the Army base hospitals along the Mexican border for the purpose of obtaining data based on actual service. Among other results, this trip demonstrated the fallacy of looking upon a base hospital as a mobile unit and it showed also that, however complete the pre-

liminary equipment might be, such organizations would grow and expand after their establishment according to local requirements. No two hospitals on the border were of the same size, organization or equipment, nor were they dependent upon the field equipment called for in the allowance table; in fact, they were general hospitals in all but name, location, and the disposition of patients, and once established they could not have been moved without complete disruption, in this respect differing radically from field hospitals and evacuation hospitals.

Among the problems which caused special difficulty in selecting these outfits were those relating to electrical apparatus of all kinds, including X-ray and laboratory outfits and certain mechanical kitchen appliances. Realizing the possibility of service in France, investigation had shown that electric currents used in that country not only differed greatly from those to which we are accustomed, but that there was great diversity among the different districts of France itself, so that special provision was necessary to enable any particular piece of apparatus to meet the unknown requirements. There was also much discussion regarding the advisability of providing certain additional features in advance, such as laundry equipment, ice machines, and even electric-lighting plants. On the Mexican border such facilities were locally available for all the base hospitals, but it was uncertain whether such would be the case in France. As far as the Navy was concerned, we never had funds enough available for any unit to indulge in these luxuries, but certain Army units with strong financial backing were ultimately equipped with all these facilities, the expenditure in some cases amounting to $100,000, or four times the sum originally contemplated. Within the past three months I have seen a number of these hospitals in operation in France, and while in most cases these additional facilities have proved desirable, some of them, particularly ice machines, have been deemed superfluous in view of the necessity for conserving shipping space. Laundry facilities are practically lacking over there and this is being met by portable apparatus of French design, mounted on trucks; two of these are capable of handling the output of a 1,000-bed hospital and a good many have been already supplied by the American Red Cross Commission in France.

While the foregoing remarks, except those relating to equipment, pertain more or less to both Navy base hospital units and station hospital units, these organizations differ in minor details. The formation of station hospital units was not undertaken until last June, when the Surgeon General decided that he would utilize 10 additional organizations of smaller type than the base hospital units provided.

With his approval, therefore, the plan and organization indicated in the following circular letter was promulgated:

1. At the request of the Surgeon General of the Navy, the Bureau of Naval Affairs, American Red Cross, has undertaken to organize a new group of units to be known as "Navy station hospitals." These units are for the purpose of supplying, in part, the personnel for a number of new hospitals which are now being erected at various naval stations along the Atlantic Coast and one or two points elsewhere within the United States, to care for the rapidly expanding Naval personnel.

2. With a view to drawing as lightly as possible upon the civilian profession only five medical officers will be required for each unit, additional members being furnished by the Surgeon General to fill the complement from young officers already enrolled in the Naval Reserve Force. No equipment will be required, but if funds are available for the purchase of X-ray or dental outfits, ambulances, etc., such donations will be gladly accepted.

3. For organization purposes the personnel required for each unit is as follows:

Medical officers.—One director (who may be chief of either the medical or surgical section) surgeon, with rank of lieutenant commander; one chief of medical (or surgical) section, surgeon with rank of lieutenant commander; one specialist, eye, ear, nose, and throat, Passed Assistant Surgeon, with rank of lieutenant; one specialist, laboratory, Passed Assistant Surgeon, with rank of lieutenant; one specialist, X-ray, Passed Assistant Surgeon, with rank of lieutenant.

NOTE.—These grades correspond to the following in the Army, with the same rate of pay:

	Navy.	Army.
Surgeon	Lieutenant commander	Major.
Passed assistant surgeon	Lieutenant	Captain.
Assistant surgeon	Lieutenant (junior grade)	First lieutenant.

Nurses.—Twenty nurses, one of whom will act as head nurse until the unit is called into service.

Enlisted personnel.—One commissary steward; one chief yeoman (man or woman); four yeomen, second or third class (men or women); two carpenter's mates; two electricians (general); two plumbers and fitters; two coxswains or machinists, second class, for chauffeurs or mechanicians; one cook, first class; four cooks, third or fourth class; ten mess attendants.

When practicable it is desirable that medical officers and nurses be drawn from one parent institution, but this is not an indispensable requirement.

4. The director should select the members of his staff and inform the director, Bureau of Naval Affairs, whom he nominates for the various positions. The director should also nominate a head nurse, and it is important that she be a woman of executive ability in whom the nurses have confidence. Upon her will devolve the duty of selecting the nursing staff, all of whom must be, or become, members of the Red Cross Nursing Service.

5. Medical officers, nurses and enlisted men must be enrolled in the Naval Reserve Force. While the period of enrollment is nominally four years no one will be called upon to serve longer than the duration of the war, and it is important that this should be explained to all concerned. It must also be

understood that members of the unit agree to serve wherever and whenever called upon by the Surgeon General of the Navy.

6. The enlisted personnel will be enrolled at the navy yard or local naval recruiting office, and the recruiting officer will be furnished with a list of the various ratings as soon as the organization of a unit is begun. The director should keep in touch with the recruiting officer and send to him for enrollment any men whom he considers available and desirable; it is probable, however, that the recruiting officer will be able to obtain most of the men needed. Rates of pay and qualifications for the different ratings may be ascertained upon inquiring of the Navy Recruiting Officer.

7. It is expected that all members of a unit will serve as a group and not be assigned to independent duty as individuals.

8. Official information concerning enrollment in the Naval Reserve Force will be furnished as soon as a unit is authorized. All members will have to be vaccinated and take typhoid prophylaxis as soon as practicable. As soon as the head nurse is appointed she will be furnished with full information regarding the enrollment of nurses by the Director, Bureau of Nursing Service, American Red Cross, Washington, D. C.

9. At naval hospitals, now being erected, accommodations are provided for officers, nurses and enlisted men. If, in any locality, officers and nurses are not provided with quarters they will be granted commutation in lieu of same.

10. The outfit for enlisted men will be furnished by the Government. Such additional uniforms as the nurses require will be furnished by the American Red Cross, and if practicable, the local Red Cross Chapter should assist in providing funds for this purpose. Officers will be required to purchase their own uniforms; but officers in the Naval Reserve Force, when assigned to active duty in time of war, are credited with a uniform gratuity of $150. If an officer resigns from the service before the expiration of his four year's enrollment this sum must be refunded, but an officer placed on the inactive list after the war, or before, if his services are not needed, would still be entitled to this allowance. Medical officers of the Naval Reserve Force will require the following uniform:

1 overcoat.
1 blue service uniform (blouse, trousers, and cap).
2 to 4 white service uniforms (blouse and trousers).
1 white cap.
1 sword and service belt.
1 or 2 pairs of white shoes (worn with white service dress).

White socks are worn with white service, and black socks with blue uniforms.

With the experience already gained in organizing base hospitals there was little difficulty in starting these smaller units, which proved, indeed, to be very popular, especially in the smaller medical centers which would not readily support more elaborate organizations. As it had not been found practicable to establish a Navy base hospital unit south of Philadelphia, I was particularly glad to authorize units of this other type in Austin, Tex., and Atlanta, Ga., both of which have since been completed most successfully. Eight of these organizations have now (January, 1918) been assigned to duty at our newly constructed naval hospitals, while the others are either mobilized or ready for assignment wherever and whenever needed.

With one exception our base hospitals have now been doubled in capacity, with additions to the equipment far beyond a mere increase of the original allowance; most of these additions were provided by the Bureau of Medicine and Surgery, but certain special items—such as motor cars and ambulances—were obtained through the Red Cross. Material increase was also necessary in the personnel, so that the full complement is now as follows:

[1] 2 medical officers (commanding officer and executive surgeon).
18 medical officers.
1 pay officer.
1 dental officer.
60 nurses.
1 pay clerk.
1 commissary steward.
1 chief yeoman.
4 yeomen, second and third class.
2 carpenter's mates, third class.
2 electricians (general) third class.
2 plumbers and fitters.
80 hospital apprentices, first and second class.
2 coxswains or machinist's mates, second class.
1 cook, first class.
4 cooks, second class.
8 cooks, third class (or fourth).
20 mess attendants.
[1] 1 pharmacist.
[1] 2 chief pharmacist's mates.
[1] 3 pharmacist's mates, first class.
[1] 4 pharmacist's mates, third class.

Navy base hospitals No. 1 and No. 5 are now operating abroad, while No. 2 and No. 3 have recently been mobilized for foreign service; No. 4 is ready in all respects, but has not as yet been called upon. Before leaving France I had the pleasure of seeing one of these units installed and "in commission," doing work of the highest value despite local drawbacks and inconveniences which, in this country, would have seemed appalling. The building occupied was a Carmelite convent, built centuries ago, and still lacking all modern facilities except—at times—electric light and having a very limited supply of fresh water. Oil stoves had been taken over, but the original supply of kerosene was soon exhausted and no more was obtainable. Fortunately small coal stoves could be purchased locally and there was a Navy coal pile which could be depended upon. The labor involved in making such a place habitable was onerous and, upon occasions, repulsive, but difficulties were being met in a spirit of cheerful optimism which overcame all obstacles and a month later the director informed me "it looked like a different place."

[1] Assigned to unit by Bureau of Medicine and Surgery.

While endeavoring to perform the duties outlined above, and now practically completed, the director of the Bureau of Naval Affairs naturally encountered many unforeseen and unfamiliar problems which, at times, caused him no little anxiety and embarrassment. As a recompense, far outweighing such minor considerations, he looks back upon the formation of personal acquaintance and in some cases, I trust, lasting friendship, with many of the most distinguished representatives of our profession in this country. I found, as a rule, that details regarding the Navy generally and the medical corps in particular, were little known to them, though it was seldom indeed that this was due to lack of interest. But the successful surgeon is a busy man—he works "three shifts a day" as a normal routine—and under ordinary circumstances his path and ours lie far apart. Now many are wearing the "Navy blue," and it may be hoped that one of the happier results of the present catastrophe will be a better mutual understanding between members of the Navy medical corps and their confrères, until lately "in civil life."

THE EXAMINATION OF 8,518 MEN FOR THE DETECTION, ISOLATION AND TREATMENT OF MENINGOCOCCUS CARRIERS, AT THE UNITED STATES NAVAL TRAINING STATION, SAN FRANCISCO, CAL.

By P. S. Rossiter, Medical Inspector, United States Navy, and A. J. Minaker, Assistant Surgeon, United States Naval Reserve Force.

Upon the entry of the United States into the present war, and the consequent enormous influx of recruits from all parts of the country into camps and training stations, it became necessary to be on the watch for outbreaks of the various contagious and infectious diseases, and in view of the experience of the entente allies, and especially of the British, with epidemics of cerebro-spinal fever, the question of the detection, isolation, and treatment of meningococcus carriers became of primary importance.

The history of epidemics of cerebro-spinal fever in years past and since the outbreak of the present war has been so thoroughly dealt with by recent writers that no review is deemed necessary, nor is it within the scope of this paper to present the subject of meningitis in its various details, but merely to briefly report our findings during the culturing of something over 8,000 men.

In all recent reports the one outstanding feature concerning the transmission of this disease appears to be the fact that we have in the community at large a variable percentage of carriers of the meningococcus, who, under certain conditions of crowding and inadequate ventilation, transmit the organism to others, who either develop the disease, rid themselves of the infection, or in turn, become additional carriers.

In such carriers the organism is found in the nasopharynx, and particularly in the vault and adenoid area.

Sporadic cases of this disease had occurred for a number of years at all our training stations. At the naval training station, San Francisco, there had occurred one case in August, 1916, one case in January, two in March, one in April, two in May, and two in June, 1917.

Prior to the declaration of war the average complement of the San Francisco training station had been from 900 to 1,200, which number, upon mobilization, was rapidly increased to more than 5,000.

While there was no indication of an epidemic of cerebro-spinal fever at this station, and in fact the proportionate incidence of the disease had decreased with the increased personnel, due, it is believed, to improved housing conditions incident to quartering the men in camps rather than in barrack buildings, yet as several cases of cerebro-spinal fever had developed in drafts sent from the naval training station, San Francisco, to other camps, it was deemed advisable to culture the entire personnel with a view to the detection, isolation, and treatment of meningococcus carriers.

Parenthetically it may here be stated that the development of the disease in the drafts mentioned was subsequently found to be due to crowding and unhygienic conditions en route to and at the camps to which these men were sent, and that upon rectifying these sanitary defects the disease disappeared, and it is our opinion that cerebro-spinal fever is always produced by the lowering of resistance through fatigue, intercurrent disease, of which measles is the most important, or conditions of crowding and inadequate ventilation upon individuals who are carriers of the organism in their nasopharyngeal tract, combined with certain elements of local tissue, phagocytosis, or the presence of inherent or acquired antibodies in the serum, but we incline to the belief that the chronic carrier does possess such antibodies and a consequent relative protection.

These latter questions we have been trying to settle by using the serum of chronic carriers to agglutinate various known strains of meningococcus, the serum of known meningococcus carriers being used as a control, but so far only one case has given a suggestion of agglutination, and the results have been too varied to enable us to make any positive statement in regard to inherent or acquired antibodies in the serum of carriers, although certain cutaneous reactions made with a titration of the meningococcus prepared by Prof. F. P. Gay, of the University of California, seem to confirm the belief that such antibodies exist.

The problem presented was a serious one. The task of culturing a population of 5,000, which was being increased at a varying rate of from 1 to 200 per day, and of developing a rapid and reliable

technique so that we could, at an early date, forward from the station drafts, all members of which had been shown to be negative as meningococcus carriers, was not an easy one. The problem of laboratory equipment, getting together of a sufficient number of competent bacteriologists and making the enormous amount of culture media required was in itself formidable, but within 10 days the laboratory was equipped, its personnel organized, and a sufficient supply of culture media prepared to enable us to start culturing 150 men per day.

Technique.—The first question arising was the method to be adopted in procuring secretions suspected of containing meningococci, and it was decided to use the West tube generally advocated for this purpose, the pledget of cotton on the applicator being passed from the tube behind the uvula into the posterior nares, being then withdrawn into the tube and later extruded and the gathered organisms sown upon the desired media.

We have since discarded the West tube, the principal use of which is to prevent contamination by mouth organisms, as it was found to be extremely difficult by this method to reach the higher spaces in the adenoid region, the most common habitat of the meningococcus, the applicator extruded from the West tube having a tendency to curve forward upon itself before attaining the desired elevation. We have found that, by using a small pledget of cotton upon a wire applicator, the curved end being about 1½ inches in length and bent at an angle of 85°, and with the exercise of caution in procuring the material by medical officers, who have been carefully trained in this technique, little, if any mouth contamination results.

We have tried practically every type of medium which has been recommended for growing the meningococcus, including Flexner's sheep serum water agar, Martin's liver media, both with the addition of serum water and hemolized blood, pea media, trypagar, modified Vedder's, calf's liver agar, gelatin agar, a modified Loeffler's, and the Hiss water media with the various carbohydrates, and have found the most uniformly reliable media for primary cultures to be human blood agar.

Certain English investigators, notably D. Lloyd,[1] have demonstrated that the best suited medium for growing the meningococcus is one rich in "vitamins." To obtain this result we enriched nutrient agar media with human blood, 7½ to 10 per cent, in a 3½ per cent agar at plus 0.3 reaction. With a larger amount of "buffet," i e., dibasic potassium phosphate and calcium carbonate, we were able to use a lower percentage of blood, yet we were led to believe that the presence of the hemoglobin exerted a favorable influence over the primary growth of the meningococcus and as human blood could be

obtained plentifully from volunteers, we have standardized on a 7½ per cent blood media. We did not find it requisite with this media to determine the hydrogen ion concentration described by Meyer.[2]

Finding that the final sterilization in 500 mil lots at 15 pounds pressure for 30 minutes was inadequate to destroy all spores, as the media was not wholly liquefied during that period and an unmelted core would remain in which live spores were contained, it became necessary first to liquefy the media in a water bath at 100 C. and then give it a full half hour in the autoclav at 15 pounds pressure. The 500-mil lots are then cooled to 40 C. and human blood is added in sufficient quantity to make 7.5 per cent. Where a large amount of blood was used inhibition seemed to take place, and above 10 per cent the meningococcus usually refused to grow.

Comparing all the media enumerated with the blood agar as a control, we found that in many instances where a sensitive strain was cultured and where cultures sown even on Flexner's sheep serum water agar or modified Loeffler's failed to reproduce, an abundant growth was secured from the blood agar. These results were frequently verified; therefore, having numbers of men willing to donate blood for the purpose, we were able to obtain what we consider an ideal and reliable media. We, however, found that about once in 100 times human blood seemed to have an inhibitory action on the delicate meningococci. In these cases recultures were made and repeated results seem to verify the belief that possibly antibodies exist in certain immune individuals in the proportion of about 1 per cent of young men. On this account, in order to avoid the use of media which may contain inhibitory antibodies, each batch of media is now tested with a pure culture of the normal and para groups of meningococci[3] prior to use.

Although we have had a large number of voluntary donors of blood, still on account of the enormous quantities of media required it has been necessary to conserve our blood agar, and we have found that the organism in subculture will grow readily on several media which are not so well suited for primary cultures, the best of which we have found to be Flexner's sheep serum water agar[3] and an extremely simple medium of our own, prepared as follows:

Calf's liver, 500 grams, is finely minced and allowed to stand over night in the ice chest in 1,000 mils of water. This is squeezed through gauze and cooked for one-half hour in the rice cooker with 2 per cent peptone and 0.5 per cent sodium chlorid. This broth is then clarified with the whites of two eggs and carefully titrated to plus 0.3 reaction. Thirty grams of carefully washed agar are then added and the medium again titrated, autoclaved and poured. We consider a reaction of plus 0.3 in all our media to be most important.

In the earlier stages of our work we were obliged, owing to lack of a reliable polyvalent antimeningitic serum for agglutination purposes, to rely largely for differentiation upon the Hiss serum water medium, with the addition of maltose, dextrose and lactose. This method served to differentiate the meningococcus from the crassus and catarrhalis groups of gram negative diplococci, but we found that we were obtaining a certain percentage of members of the pharyngeus group, giving the same reaction with maltose, lactose and dextrose as the meningococcus, to avoid which we were obliged to add levulose in order to bar out this intruder, which it did, with the exception of group 3, which has the same cultural characteristics on all of these media as the meningococcus. Here again we had difficulty, for we found that by fractional sterilization at 100° for three consecutive days with the 1 to 3 serum and the various carbohydrates and litmus, apparently rotary action of the sugars at times occurred. To avoid this, we now sterilize separately on three consecutive days our carbohydrates in 25 per cent solution, the litmus in 10 per cent solution, and the serum water 1 to 3. These are then mixed and autoclaved at 10 pounds for 30 minutes. Using 1 per cent of carbohydrate with liver agar and adding Andrade's indicator gave us a very satisfactory differentiation. This is now being used in connection with the Hiss water method and litmus, and from our findings is equally accurate.

We also found that Meyer's modification of Martin's medium and sheep serum water agar with 1 per cent carbohydrates and 1 per cent Andrade's indicator proved an excellent medium from which we had little difficulty in picking the colonies for macroscropic agglutination, as well as differentiations. In differentiation by the Hiss media, with the carbohydrates and litmus, if the results are to be relied upon, it is essential to have absolutely pure cultures, and the media must be prepared with the utmost care, since any slight break in technique will completely vitiate the end results.

Method of growing the meningococcus primarily.—On account of the difficulty at first encountered in obtaining an adequate number of Petri dishes, we used both 4-inch Petri dishes and 1-inch diameter slants for our primary cultures, but soon discarded the slants in favor of the Petri dishes, on account of the greater facility in inoculating the media, the larger presenting surface and the greater ease with which the more scattered colonies could be viewed and picked. We have also used the three-dish method, by inoculating dish No. 1 and immediately transferring part of the inoculated surface to dish No. 2 by a sterile glass rod, and inoculating dish No. 3 from No. 2 in the same manner. We do not believe this method necessary, as the inoculation of one half of a 4-inch dish by sowing

the collected organisms from the swab, and the immediate inoculation of the remaining half from the first by means of a sterile glass rod gives us sufficient scattering of colonies to permit the meningococcus to be picked with comparative ease.

We also found unglazed porcelain covers for the Petri dishes to be of the utmost value in doing away with a troublesome amount of water of condensation.

The suspected secretions are immediately sown on warmed media and at once placed in the incubator. Where cultures are taken at a distance from the laboratory, a portable incubator is used for transfer of the inoculated plates to the laboratory. Cultures are examined after 20 hours. Colonies are examined individually and smears made from suspicious colonies are stained by Gram's method to determine the gram negative diplococci. Gram negative diplococci being demonstrated, subcultures are made on successive days until pure cultures are obtained. The pure culture is determined for meningococci by the reaction in the Hiss serum-water-carbohydrate medium, as well as by agglutination with a polyvalent antimeningococcus serum in dilutions of from 1 to 50 to 1 to 400, with normal horse serum in equal dilutions as control.

As we became more familiar with the macroscopic appearance of the characteristic meningococcus colonies, we were frequently able to pick pure cultures from the 20-hour growth, and identify tentatively by means of a modified Krumwiede-Tunnicliffe microscopic slide agglutination.[4, 5] Our method consists in picking the suspected colony and emulsifying in physiologic salt solution. This emulsion and the polyvalent serum are then mixed on the slide in the desired dilutions. At the same time normal horse serum and the bacterial emulsion are mixed on the same slide in the same dilution as control. The slide is then incubated at 37° to dryness. The preparation is stained, and if agglutination has taken place, the case is at once sent to the isolation camp as a tentatively positive carrier. Subcultures are immediately made, and the result verified by macroscopic agglutination in dilutions of 1 to 50, 1 to 100, and 1 to 200, incubated at 55° for 18 to 20 hours, and by running the suspected organism through the carbohydrate media.

We at first had difficulty in obtaining a reliable serum which contained both the normal and para groups of meningococci among the commercial productions, and it was not until we obtained a supply of serum, first from the University of Toronto laboratory (the Fitzgerald serum) and later from the New York Board of Health and Rockefeller Institute, that our agglutinations were deemed sufficiently reliable to depend on them alone. We have more recently found the new Cutter Laboratory serum, which we understand is

now made from the Rockefeller Institute strains, to yield very satisfactory results. By means of monovalent rabbit sera obtained from the Rockefeller Institute, we have been able to determine the relative incidence of the normal and para types of meningococcus in our cases. This we find to be normal 78 per cent, para 19 per cent, indefinite 3 per cent.

Of a series of 1,000 agglutinations, 148 were definitely positive by the slide method with the Rockefeller Institute serum. In each of these cases, verification by the macroscopic method was positive. Where agglutinations were only suggestive, we had to carry through the carbohydrate reactions for determination. Suggestive agglutinations with typical carbohydrate reactions are promptly isolated. Of 200 attempted agglutinations in cases giving indicative carbohydrate reaction, 52 per cent proved finally positive.

The agglutinating power of a number of the commercial sera for the micrococcus catarrhalis and the diplococcus flavus suggests the possibility of the confusion of these organisms in the preparation of antimeningococcus sera and the consequent agglutinating power of such sera for organisms other than the meningococcus.

Subculturing the meningococcus.—Subculturing requires the greatest care, as the smallest factor interfering with the growth frequently results in the loss of the meningococcus. Furthermore, when cultures of this delicate organism become even slightly contaminated by the pneumococcus or diphtheroid organisms (its most frequent associates) it is extremely difficult to obtain a pure culture.

To ascertain if such contaminating organisms interfered with definite agglutinations, the usually associated bacilli and cocci were mixed with known stock strains of the meningococcus and the mixtures subjected to slide agglutinations. In practically every case, the meningococci grouped themselves and the foreign bacteria remained scattered over the field. In the case of a gram positive diphtheroid bacillus, and a certain small gram negative bacillus, the contaminating organisms grouped themselves with the meningococci. From the above it is evident that agglutinations are frequently possible in a 20-hour growth, even in the presence of slight contamination, and it is practicable to make a tentatively positive diagnosis and isolate the carrier within 24 hours of culture. We at times encountered a gram negative bacillus occasionally in diplo formation, which gave a pronounced agglutination with the Rockefeller Institute serum and had to be most carefully observed to avoid confusion.

Isolation and treatment of carriers.—Men proven to be carriers are immediately isolated in a special quarantine camp and treated for five consecutive days. Treatment is then discontinued for 24 hours and another culture taken from the nasopharyngeal vault. This culture proving positive, the treatment is repeated. Should it prove

negative, no further treatment is given, and a second culture is taken at the end of five days. This routine is continued in the case of each carrier until four consecutive negatives at five-day intervals are obtained, when the man is discharged to duty and an entry made in his health record that he has at one time been a meningococcus carrier and recommending him for further observation.

All men remaining on the station have been recultured not less than two weeks after discharge and to date no case discharged after four consecutive negatives at five-day intervals has proven positive upon subsequent culture.

A card index is kept of every man cultured, with reference to the laboratory sheet on which the full report of his cultural and agglutination reactions is recorded.

Numerous methods of treatment have been tried, with varying results. Chloramine was not obtainable, and the steam-chamber method advocated by Gordon and Flack[6] seemed a circuitous method by which to deposit a small amount of antiseptic in the desired locality.

Among the various treatments tried, the most effective, each of which gave more or less satisfactory results, have been:

Irrigation of the nasopharynx three times daily with dilute Seiler's solution, followed by irrigation with 1 per cent zinc sulphate solution, or by application with a swab of 2 per cent zinc sulphate solution.

Irrigation with Seiler's or with Seiler's and peroxide followed by swabbing with one-fourth of 1 per cent iodine.

Irrigation, followed by swabbing with a mixture of iodine, 0.5 per cent; phenol, 1 per cent; ferric chlorid, 10 per cent in glycerin.

Dichloramine-T in chlorinated eucalyptol and chlorinated paraffin oil.

All of the above methods have yielded more or less satisfactory results, but we are of opinion that swabbing the nasopharynx with the phenol-ferric-chlorid-glycerin mixture three times daily, or the post nasal spray of dichloramine-T solution is especially efficacious. In the case of the latter, we have been unable to continue its use in the strength recommended by Dakin, on account of the painful irritation produced after the first few treatments, but have found it thoroughly practicable and sufficiently effective when diluted one-half with plain paraffin oil.

A point of observation of the utmost importance was the tendency of certain chronic carriers, when allowed unrestricted association, to reinfect associated carriers, who had given one or more negatives, and one case under treatment for 80 days repeatedly reinfected men who had given two or more negatives, who were allowed to

sleep in the same room, the two men occupying a room of 729 cubic feet, having one window and one door.

The U. S. S. *Rainbow*, where the men were crowded, and the ventilation none too good, yielded a large percentage of carriers, and the radio station, where a number of men were closely associated in closed rooms and alternately using the same telephone transmitters, yielded 7 carriers out of 40 men.

The question of a filterable virus etiology brought up by Hort[7] and others suggested itself. The only evidence which we can bring to bear on this point is the single case of cerebro-spinal fever which occurred on this station after culturing the personnel was begun. This case occurred in a man not yet cultured. The same type of meningococcus was isolated from his spinal fluid, from his posterior nares, and from the posterior nares of two out of three contacts.

At the present time every man on the station has been cultured and either found to be negative or has been isolated and treated, and all recruits received are cultured within 24 hours of their arrival and carriers immediately isolated.

Needless to say, an enormous amount of statistics has been accumulated from our work, but for the purpose of this paper we deem it necessary to cite only a few tabulated results, which are in close accord with the findings of the British workers.[6-8]

Total number of cultures taken	8,518
Number of carriers	261
Percentage of carriers	3.16

Number of cultures, results by months, July to December, 1917.

July:	
Total number of cultures	676
Total number of carriers	13
Percentage of carriers	1.92
August:	
Total number of cultures	3,453
Total number of carriers	119
Percentage of carriers	3.1
September:	
Total number of cultures	2,029
Total number of carriers	73
Percentage of carriers	3.6
October:	
Total number of cultures	1,325
Total number of carriers	25
Percentage of carriers	1.9
November:	
Total number of cultures	1,033
Total number of carriers	31
Percentage of carriers	3.0

T. N. Bassett, at the Royal Naval College,[9] found 1.12 per cent of carriers in 4,730 supposedly noncontacts, and 5.77 per cent of positives in men who had been in contact with known carriers.

Observation of 173 consecutive carriers under treatment showed the following results:

	Cases.
Giving 4 consecutive negative cultures	22
Giving 1 positive and 4 negatives	37
Giving 2 positives and 4 negatives	9
Giving 3 positives and 4 negatives	4
Various results	101

Length of time in isolation:

22 days	22
25 days	43
27 days	24
35 days	29
45 days	42
55 days	22
65 days	8
75 days	1
80 days	1
82 days	1

Nine hundred and sixty consecutive cases showed the following florae:

Gram negative diplococci	410
Meningococci	39
Diphtheroids	212
Pneumococci	78
Gram negative bacilli	108
Straphylococci	98
Streptococci	24

The gram negative diplococci and diphtheroids were usually associated, and where gram negative bacilli were found, they were usually in almost pure culture.

In the 8,000 cases 13 diphtheria carriers were detected, isolated, and treated.

Summary and conclusions.—1. That there are in the community at large, especially among young adult males, a variable percentage of carriers of the meningococcus, varying from 1.5 per cent to 3.5 per cent, who, under certain conditions of crowding and inadequate ventilation, transmit the organism to others, who either develop the disease, rid themselves of the infection, or in turn become additional carriers.

2. That it is entirely practicable, by cultural methods, to detect these carriers and isolate them within 24 to 72 hours.

3. That under proper hygienic conditions little is to be feared from such carriers, but that under conditions of crowding, inadequate ventilation or lowered resistance they become a serious menace.

4. That a large percentage of such carriers are readily freed of infection by various modes of treatment which tend to deposit antiseptic agents on the previously cleansed mucous surfaces of the nasopharyngeal vault.

We wish to acknowledge our indebtedness to Profs. F. P. Gray and L. C. Hall, of the University of California, and Dr. K. F. Meyer, of the Hooper Foundation Institute, for their advice and encouragement in this work, also to Assistant Surgeons Chamberlain, Fielder, and Goettsch, United States Naval Reserve Force, for their tireless, earnest and careful work.

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LABORATORY DETECTION OF CARRIERS OF MENINGOCOCCI AT THE LABORATORY OF THE UNITED STATES NAVAL TRAINING STATION, GREAT LAKES, ILL.

By C. W. Barrier, Assistant Surgeon, and R. M. Choisser, Assistant Surgeon, United States Navy.

In recent years cerebro-spinal fever has become one of the principal diseases of camp life and is especially prevalent at all training and mobilization points where younger men from all parts of the country are brought together. It has long been thought and doubtless correctly that the spread of this disease is due to carriers and the detection of these carriers has fallen to the laboratory. This work has formed a large part of the work of the laboratory of the Great Lakes Station for the past few months. At first we were able to take only 50 to 100 cultures a day, but when we compared this small number with the large number that we saw would have to be made to render our work effective, the magnitude of the task became apparent. By a slow elimination of nonessentials and an improvement in methods we have reached a point where we now make from 300 to 1,000 cultures a day and our grand total since July has long passed 50,000.

Such a large number of cultures has made the question of culture media an important one. We have selected blood agar from the many that have been used for such work. The reasons for this choice are, first, the ease with which it is made and, second, its suitability for growing the meningococcus. The ease of making blood agar becomes quite apparent when we compare it with most of the other media suggested by various laboratory workers. Nutrient agar is found in every laboratory, and blood can be obtained from a number of animals, and the mixing of these in proper proportions is an easy matter. The suitability of a medium is determined by two factors: It must possess substances in form needed for the growth of the organisms, and it must be of such a nature that the colonies can be recognized with ease after they have been grown. The best growth has been secured on blood agar, and the blood serves as a useful indicator in separating the colonies into two large groups—the hemolytic and the nonhemolytic.

The agar is not the usual nutrient agar but a modified one, being richer in some substances, especially peptone. The general formula is: Agar, 18; peptone, 10; beef extract, 4; salt, 5; water, 1,000.

The two important points in the preparation of agar are to obtain the right reaction and to have the correct amount of moisture. A reaction between plus 0.2 and plus 0.5 gives what is desired, but to pass these limits in either direction lessens the value of the medium. The titration is not a simple thing and errors are easily made, due to the presence of the agar and the necessity of titrating while hot. The best results can be obtained by using a large amount of phenolphthalein and calling the neutral point the first distinct but faint pink, which does not disappear on further boiling.

The percentage of agar determines the stiffness of the medium and available moisture, a matter very important in a medium for the meningococcus. It is best not to stick to a fixed agar percentage, but to experiment and choose that percentage which produces a medium just stiff enough to allow easy streaking. The other factors determining the moisture of the medium are that it should be poured into plates shortly before they are used and that enough should be put into the plates to prevent drying out during incubation.

The agar is made in large quantities and is stored in 500 c. c. flasks, 300 c. c. to each. We use either goat's or sheep's blood, and do not believe that one type of blood has any distinct advantage over another, but these two animals furnish it most conveniently. Figure 1 shows the apparatus used in drawing blood.

In the flask shown in figure 1, draw about 300 c. c. of blood. If the blood flows freely and rapidly it is best not to attempt to defibrinate while the flask is filling, but when the desired amount has been

Method of obtaining blood.

Type of swab used for making cultures.

obtained the flask is detached from the needle and shaken briskly for about 15 minutes. Defibrination is effected by the wire rods in the flask. The direction of shaking should not be in a simple circle, but should be double so that the blood rises higher in its revolutions on one side than on the other. There should be a slight jerk in the shaking so that the blood is brought against the wires with a dash. It is our custom to take two flasks of 300 c. c. each at a time, and to bleed once every 10 days.

After the blood is defibrinated it is poured into sterile test tubes, 20 c. c. to a tube, and placed on ice. Before the blood is used it is

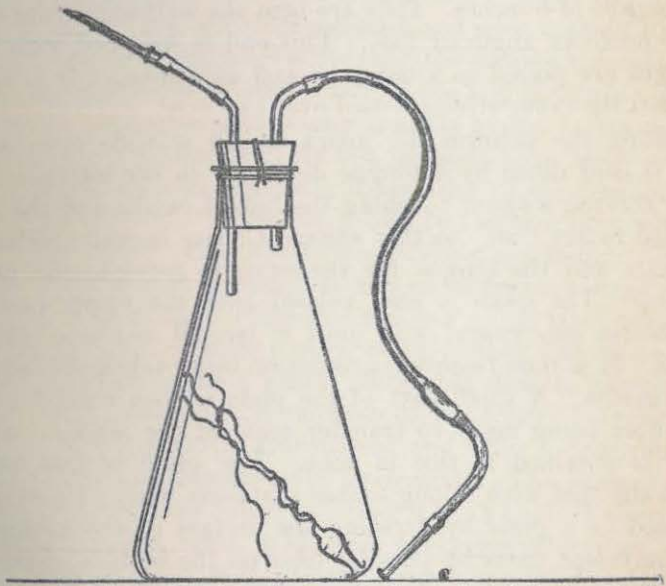

FIG. 1.—Flask with wire rods for collecting and defibrinating blood.

well to inspect the tubes for black spots, and if any are found the tubes should be discarded, as the spots indicate infection, due, in our experience, to the hay bacillus.

When the plates are to be made a sufficient number of these flasks of agar are melted up and cooled to the right point and the blood is added. As the agar is stored in 300 c. c. quantities and the blood in 20 c. c. amounts and as we wish to have two-thirds c. c. of blood to 10 c. c. of agar, we add one test tube of blood to each flask of agar, which gives the proper proportion. No attempt is made to measure the amount of agar poured to a plate, but sufficient amount is put in to cover the bottom well without tilting the plate to distribute it. In the Petri dishes we are now using, many bulge up on the bottom and about 20 c. c. of agar are necessary, but in the flat bottom dishes only about 15 c. c. are required. As stated above, these plates are poured

only a short time before being used and are protected from the dust while hardening. They are not placed in the ice box as this would necessitate warming the plates before using them.

The same method is used in making blood-agar slants. The blood and agar are mixed directly in the flasks and poured into sterile test tubes which are slanted. This saves much time over the method of tubing the agar and measuring the amount of blood for each with a pipette.

The cultures are put on the plates at the different camps of the station and are then brought to the laboratory for incubation. In taking the cultures we use a swab made of small galvanized wire, cut in lengths of 8 inches. They are bent one-half inch from one end so as to make an angle of 135°. This end is wrapped with cotton. Ten swabs are placed in a test tube and autoclaved. It is needless to say that the same wires are used over and over.

In taking the cultures the man's mouth is wide open and his tongue is held down by a tongue depressor in the left hand. The swab is entered without touching the buccal cavity and the man is instructed to say "ah" so that sufficient space is made between the soft palate and the tongue for the swab to get into the pharynx untouched. The swab is then rubbed over the upper portion of the posterior pharyngeal wall until it is well moistened with the secretion. It is then removed, precaution being taken against buccal contamination. A small part of the plate is then rubbed with the swab, effort being made to transfer some of the mucus. A better growth is obtained if this is done. The plate is then streaked through the spot with a long limber platinum wire. Three cultures are placed on a plate by dividing the surface of the medium into three equivalent parts by parallel lines on the bottom of the plate. If these lines are made with a blue wax pencil they show through the medium.

The agar plate is warm when the culture is placed upon it and care is taken to keep it warm until it reaches the incubator. The best way to do this is to transport the plate in a large box lined so as to retain the heat furnished by large rubber water bottles.

The plates are now kept at 37° for 18 hours in incubators which should not vary more than 1° in either direction. Very poor results are obtained if the temperature passes 39°, as the surface of the agar becomes dry, the colonies cease to grow, and dry on top. Upon examination of such plates, extensive water of condensation is found which may be a danger to the laboratory workers and often spoils the growth by running across the surface of the medium. The time of incubation is important. Sixteen to eighteen hours give the most typical colonies and shortly after this the viability of the organisms in the colonies begins to decrease, so that transplants

should be taken before the culture becomes too old. Again, if one accustoms himself to working with cultures of the same period of growth he becomes more proficient in the detection of the meningococcus. In examining the plates the blood in our medium, as stated above, has divided our colonies into two large groups, the hemolytic and the nonhemolytic. If it were not for this one fact we would not need to consider the hemolytic colonies, but occasionally the zone of hemolysis from these extends so far as to include colonies that are not hemolytic, and these are at times the meningococcus. The colony which is the real hemolyzer can be determined by its position in the zone and the fact that most hemolyzers are smaller, flatter and dryer than the meningococcus colonies, and some contain pigment.

The nonhemolytic colonies other than the meningococcus are eliminated by a study of their colors, size, shape and moisture. The diagnosis of the meningococcus colony is made by the following characteristics; it is nonhemolytic; its size depends upon other organisms, proper incubation and especially the quality of the medium. Under favorable conditions the colony grows to the size of a pinhead or even a match head, and almost pure cultures are found. The shape is that of a flattened globule. It is a mean between the flat colony which lies low on the surface and the one which rises like a sphere above the surface. A colony never has a plateau-like or umbilicated top, and its edges make a gentle obtuse but definite angle with the surface of the medium, and the base of the colony is markedly circular. It is not perfectly transparent and "like a dewdrop," but is slightly milky and glistens only moderately. The surface is moist, however, and when the colony is young it has a slightly slimy appearance. As it grows older it appears finely granular; the older the colony the more milky it is, and the same is true of the older part of the colony, the center. When touched with a loop a colony picks up easily, and it can now be definitely determined that it is not watery. It cannot be pushed along the surface as a whole and is not at all stringy, but is like a moist mass, made up of soft and extremely fine granules. When a colony picked up on a loop is put in a drop of water on a slide it melts off and the drop becomes turbid. A smooth and even suspension is made without any stirring. When the drop dries, there is an even milky spot on the slide having a slightly heavier border.

By study of the colonies along the above lines, most organisms are eliminated, except a few Gram-negative bacilli and some Gram-negative diplococci, a few of which are probably akin to the meningococcus. The bacilli are eliminated, of course, after the stain is made. The Gram-negative diplococci, however, offer a more difficult problem. A few can be eliminated by subculturing on such a medium as Loeffler's blood serum and observing pigment formation, but much

information is obtained from a close study of the Gram stain. The true meningococci are evenly distributed and are never in clumps. They are found singly and in pairs, not in tetrads or chains. They are plano-convex like the gonococcus, but vary in size and slightly in shape. There is an early tendency to vacuolation and not all take the counter-stain with the same intensity. The outline of the meningococcus is rather definite and there is no intimation from a stained smear that there is any substance between the cocci such as cellular products of an albuminous nature. In cultures 24 to 48 hours old only a shell remains of most of the organism. This is probably due to their fragility and tendency to early autolysis.

In finally passing on the diagnosis of a culture the agglutination test is considered the deciding factor. For a long time both a microscopical and macroscopical agglutination was done on all Gram negative diplococci from suspicious colonies, but as the results were identical in several hundred tests the microscopical method was abandoned, except where a rapid diagnosis was called for. This was oftentimes the case, as it was frequently necessary to decide whether or not men should be excluded from drafts leaving the station. In such instances one could not wait upon the slower macroscopic test. Then again cultures are often lost through contamination when transferred from the plates to the tubes.

The microscopic agglutination test is very similar to the hanging drop Widal for typhoid. In making it take two perfectly clean cover glasses from which all grease has been removed by acid alcohol and a passage through a flame. Upon each of these three there is made a slightly turbid suspension of the suspected organism by placing a loop full of salt solution upon the cover slips and adding to these drops sufficient organisms taken from the same colony to make suspensions of equal turbidity. To one of the suspensions there is added a loop full of 1–20 dilution of antimeningococcic serum and to the other an equal amount of the same dilution of normal horse serum as a control. Then invert over these slips a double concave slide.

It is very necessary that the chamber formed between the cover slip and the slide be air-tight or else the preparation will be ruined by drying. This is accomplished by first warming the slide and painting the edges of the concavities with petrolatum over which the cover slips are placed. The slide is carefully warmed again over a low flame and the edges of the cover glass pressed down with the butt end of the loop holder. The preparations are incubated for an hour at 55° and placed in the ice box for an other hour after which they are read. If positive, the drop containing the antimeningococcic serum shows a distinct clumping of the organisms, while the control maintains its former turbidity. If the suspensions were sufficiently cloudy in the beginning the results can be read with the naked eye.

but otherwise it is necessary to use the low power of the microscope. Some strains of meningococci agglutatinate within a few minutes after the addition of the serum, and incubation is unnecessary.

In the macroscopic agglutination five small tubes are used for each test, four of which contain dilutions of immune serum and the fifth a dilution of normal horse serum as a control. Into the first four tubes put 0.8 c. c. of sterile salt solution. To the first add 0.8 c. c. of a 1–20 dilution of antimeningococcic serum and mix thoroughly. This is done by drawing the solution back and forth in a small bore glass tube, graduated to 0.8 c. c., to which an ordinary gum nipple is attached. Now carry 0.8 c. c. to the second tube and so on through the four tubes, the final 0.8 c. c. being discarded. This now gives us a dilution of 1–40, 1–80, 1–160, 1–320 in the respective tubes. In the fifth tube place only 0.8 c. c. of a dilution of 1–80 normal horse serum for a control. Now, make a suspension of the cocci by adding to each 18-hour growth on blood agar slants 1.5 c. c. of sterile salt solution. The growths are then rubbed off the surface of the medium by a sterile platinum wire and are shaken until the suspensions are even. Add 0.2 c. c. of this suspension to each tube, which makes the final dilution 1–50, 1–100, 1–200, and 1–400, respectively for the test and 1–100 for the control. The tubes are now shaken separately until a uniform mixture is obtained and are placed in the incubator at 55° overnight. The following morning they are put in the ice box for several hours after which the results are read. The results are strikingly clear cut. In the negative ones no change will be noticed, or else a slight clumping will be seen in the control as well as in the tubes containing the immune serum. In the positive ones the first tube is clear with a heavy clump at the bottom, the second shows a smaller clump with probably a slight turbidity, and the third and fourth show still smaller clumps with a greater turbidity. The control remains unchanged.

We are conscious of numerous objections raised against agglutinating cultures grown on a medium containing blood serum, but we consider these ultrascientific. When the advantages of a sure and luxuriant growth are borne in mind as well as the uniformly good results, checked by various means, we must consider blood agar as the medium of choice for routine work.

It was stated above that the agglutination test was final in determining the diagnosis, but in reality the test is rather arbitrary, for there is sufficient reason to believe that many pathogenic cocci, which resemble the meningococcus in every other respect even to the sugar fermentation, do not agglutinate with the sera used. Dr. Mathers, of the Memorial Institute, has cultures obtained from the spinal fluid of fatal cases that can not be induced to agglutinate with any diagnostic or therapeutic serum.

THE CONTROL OF DIPHTHERIA CARRIERS AND SUSPECTS, CITY PARK BARRACKS, BROOKLYN, N. Y.

By G. B. WHITMORE, Passed Assistant Surgeon, United States Navy, and P. B. WELCH, Assistant Surgeon, United States Naval Reserve Force.

During the latter part of September an outbreak of diphtheria occurred in the City Park Barracks, Brooklyn, N. Y., which was the subject of a preliminary report. At that time we stated what, in our opinion, was the original source of infection with the most probable routes of dissemination of contagion together with the methods used to control this outbreak.

The following is a résumé of our previous work, including what seem to us to be not only interesting but very important facts well established by our experience in the control of this outbreak, viz, the frequency of recurrence of positive cultures in cases of clinical diphtheria and carriers which have had two or more successive negative cultures taken at 24-hour intervals. From our experience it has been obvious that if we had been satisfied with the conventional two successive negative cultures required by most hospitals and boards of health to discharge a man from observation we would have been reinjecting living virulent diphtheria bacilli directly into the same squad rooms we have been so careful to sterilize; and with what results? More cases of diphtheria from an unexplainable source would have occurred as has actually been the case elsewhere in our service.

We cite here the case of one man (W. G. H.), landsman for electrician, who was admitted to our isolation ward with a positive culture on the 17th of October and finally discharged from observation on the 30th of October, after having obtained six successive negative cultures, with the following interesting if not alarming results:

Nine days after his discharge from observation the first case with a positive culture was taken from his squad room and isolated. Then six other positive cases were taken from the same squad room, as follows: On the 17th of November a clinical case of diphtheria was found and sent to isolation. On the 21st of the month two more positive cases were found. On the 27th another case was found, followed by two cases on December 2 and 3, making a total of seven cases occurring in a squad room accommodating 48 men in a period of 34 days, all traceable to this one man who was discharged with six successive negative cultures and who subsequently was found to harbor living virulent diphtheria bacilli.

In connection with this squad room another case of interest is that of E. G. B., landsman for electrician, a clinical diphtheria with two positive cultures, who was transferred to the Willard Parker Hospital for treatment. This patient was discharged to duty from the

hospital after having two negative cultures. The following day a confirmatory culture was taken by us and found to be positive. This was followed by positive cultures on two successive days and a reappearance of a diphtheritic membrane.

It would appear to us that these two instances are clear enough to bear out our contention that all cases with positive cultures, whether clinical diphtheria or carriers, should be kept under observation for a longer period of time than is customary.

In addition to these particular instances, the following is quoted from our statistics: "Out of 63 men isolated with positive cultures 14 have had two or more successively negative cultures at 24-hour intervals followed by positives, while nine have had three or more negatives followed by positives. One case has had four negatives and another six successive negative cultures, only to be followed by a positive."

The importance of these occurrences as they affect the control of epidemics can not possibly be overemphasized when we realize that the average diphtheria case is discharged from observation on obtaining two successive negative cultures at 24-hour intervals. These cases being returned to their squad rooms and duties still harboring living virulent diphtheria bacilli in their throats and nasal passages infect the men with whom they are associated and men who may be less resistent to infection with the diphtheria bacilli and who, in turn, are a source of danger through contagion to their associates.

One might naturally think that our results were due to faulty technique or errors in diagnosis. This, however, would not seem to be the case because we have had considerable experience and the technique is very simple. The cultures are taken from the nose, nasopharynx and fauces with cotton swabs on wooden applicators, which have been sterilized with live steam in individual glass tubes plugged at the end with cotton. Loeffler's blood agar is used as a culture medium, the innoculated tubes being sent to the laboratories of the department of health, New York City, for culture and diagnosis. In addition to this, during the last month additional cultures have been taken on all cases isolated, and on all suspicious looking throats seen during sick call, these being incubated and examined in our laboratory at City Park Barracks.

In most instances our results have been the same, the department of health reporting more positives than we have found, their tendency being, perhaps, to err on the side of safety and report as positive cases which we have thought only suspicious. However, our results have been only slightly divergent and our conclusions based on the combined findings of both laboratories.

During the past two months we have taken 4,127 cultures; 2,447 during October, with a daily average of approximately 80, of which 3.4 per cent were positive, while during the month of November we took 1,680 cultures, with a daily average of 56, of which 6.4 per cent were returned positive.

At first glance it would seem that the number of cases was on the increase. However, the reverse is the case, for during the month of October we had 34 positive cases, of which 10 were clinically diphtheria, while during the month of November we had only 29 new positive cases, of which only 2 were clinically diphtheria. The higher percentage of positives obtained during November is, therefore, not due to an actual increase in the number of cases found, but rather due to the fact that we have discovered all carriers in the barracks and have isolated them, making them innocuous as spreaders of contagion. This is borne out by the decrease in the number of cases of clinical diphtheria occurring during the month of November.

In the following paragraphs are set forth the methods we have found most successful in preventing the spread of contagion. The management of this outbreak might be roughly divided into (1) general sanitation and hygiene, as applied to the grounds and squad rooms, and (2) care of the individual, including his personal belongings, clothing, bedding, etc., and isolation ward, as well as the personnel of the squad rooms.

GENERAL SANITATION AND HYGIENE.

Grounds.—The surface soil of the grounds had been reduced to a fine powder by the constant crossing and recrossing of the men coming and going to their squad rooms and stations. This resulted in dense dust clouds arising with every gust of wind that blew through the yard. The dust was unquestionably infected by the secretions from the nasal passages and throats of men infected with acute follicular tonsilitis, if not with diphtheria, and unquestionably disseminated contagion.

This condition has been very satisfactorily remedied by covering these areas with four inches of washed gravel, which not only prevents dust clouds from forming, but prevents the formation of stagnant pools of water.

Drinking fountains.—Bubbling fountains with sanitary cups or nozzles are furnished, but the water pressure was not sufficient to force the stream of water clear of the nozzle, making it necessary for one to apply his lips to the nozzle to obtain a drink of water. This condition has been remedied by putting fewer nozzles on each water feed pipe.

Overcrowding.—The estimated air space for each man in the squad rooms of the barracks is 250 cubic feet. This space is insufficient with the facilities on hand for heat and ventilation. It has been recommended that the personnel of the squad rooms be reduced from 48 to 30. This overcrowding undoubtedly plays an important part in the dissemination of contagion by the lowering of resistance to infection of the men thus crowded and by forcing the men thus living into closer physical contact, exposing them more to droplet infection from sprays of moisture thrown out by infected men in talking, sneezing, and coughing.

Mess gear.—The mess gear is cleansed by running through two tubs, one of soap suds and the other of clear water through which live steam is driven. This is an effective sterilizer, and the possibilities of contagion through this route seem remote.

MANAGEMENT OF THE INDIVIDUAL.

Culture, isolation and immunization.—We have set a hard and fast rule to isolate all cases found with any patches in their throats. At this time these cases are all cultured as a matter of routine and given prophylactic injections of diphtheria antitoxin. Thereafter daily cultures are taken. In cases in which positive cultures are obtained the procedure varies, depending upon the clinical picture presented. In the presence of a definite exudate the patient is given a curative dose of antitoxin and forwarded at once to the naval hospital at New York (Willard Parker Hospital, contagious), together with a record of the number of positive throat cultures obtained and the amount of antitoxin given. If, on the other hand, the patient presents no evidence of an active diphtheritic process he is retained in our isolation ward for further observation and treatment; and if no membrane develops he is classed as a carrier and is carried until three successive negative cultures are obtained at 24-hour intervals.

It might be well to state here that *all* cases isolated are retained in the isolation ward until three successive negative cultures are obtained at 24-hour intervals. They are then discharged, but are restricted from liberty for 48 hours, during which time they are instructed to report for morning sick call for two more successive cultures. In addition they are instructed to return in seven days for another confirmatory culture. At the time of discharge each patient's belongings are sterilized before being returned to him.

In isolating all cases in which patches occur in the throat it may seem that we are needlessly isolating cases that we know to be cases of acute follicular tonsillitis. We feel justified in this course, however, by the results we have obtained, not only in the control of

diphtheria but also in the control of acute follicular tonsillitis, which condition we are all agreed is contagious by its own right and may by itself work havoc among the personnel of any organization. As corroborative evidence of the efficiency of this plan it can be stated that with an average complement of 3,000 men during the past two months we have only had 177 cases of follicular tonsillitis at a season when this condition is usually rampant.

Personnel of the squad rooms.—The personnel of the squad room from which the positive case is taken is cultured and all positive or suspicious cases are isolated. The squad room itself is then cleared of all gear, bags, and personal belongings of the men, and the walls, floors, and bunk frames are thoroughly scrubbed with a cresol solution. Fumigation is not practicable, owing to the temporary nature of the structure which makes sealing of the compartment impossible. While the squad room is being sterilized, the men from that room are scrubbing their bags, bunk bottoms, mattress covers, etc., it being impossible to sterilize these articles for them with the limited means at our disposal.

To prevent the possibility of having missed a positive case in the infected squad room and to prevent the widespread dissemination of contagion to other camps or ships, the infected squad room is restricted further, in that no transfers of men are allowed in or out of this room for a period of 14 days from the time the last positive culture was obtained. At the end of this period, and before restriction is removed, all men in the infected squad room are cultured again.

This measure is considered of the utmost importance, as we have found the source of our contagious diseases in several instances has been in the men received from other stations where this precaution had not been carried out.

During the routine of culturing squad rooms we have had the men report for culture before they had eaten their meals. If taken after meals, we find in a large number of cases that there is either contamination or no growth whatever.

Isolation ward.—There is at present only a makeshift isolation ward, a squad room at one end of the barracks being utilized for this purpose. There are no means of isolating cases which are suspicious clinically from those which have positive cultures whether they are clinical diphtheria or carriers. An attempt has been made, however, to keep all cases with positive cultures on one side of the room and all cases which are merely suspicious on the other side of the room. Separate mess gear has been furnished for the two sides of the isolation room and after each meal the mess gear is sterilized in the dish-washing machines in the galley.

We had expected to find instances of cross infection due to the fact that men who did not have positive cultures were forced to live in the same room with men having positive cultures. We have found no such instances to date.

As may be imagined, our facilities for isolation are far from ideal, there being no plumbing of any kind in the room and there being only one portable head in the room for all patients to use.

Separate covered metal cans are kept for waste and garbage.

In an attempt to gain the cooperation of the men, written notices have been posted in all squad rooms directing the men to report to the sick bay at the earliest sign of a sore throat.

In conclusion it would seem that our experience has conclusively developed three important facts of paramount importance in addition to the ordinary measures we have described in the control of the spread of contagion in diphtheria, viz: The absolute necessity of *multiple negative cultures* before a case known to be a carrier of diphtheria bacilli is discharged from observation; the necessity of *restricting transfer of men in and out of infected squad rooms* for a period of time covering at least the incubation period of the disease; and the obtaining of a *final negative culture* on the personnel of the squad room before the restriction is lifted.

To these facts more than to any other factors do we attribute our success in handling what might have been a serious epidemic of a serious disease, with what loss of health to the individual and economic loss to our Naval Establishment, need not be dwelt upon here.

COMMISSARY WORK AT THE UNITED STATES NAVAL HOSPITAL, MARE ISLAND, CAL.

By R. E. WEAVER, Pharmacist, United States Navy.

The purpose of this article is to describe the details of the management of the commissary department of a naval hospital. Many minor points arise, the methods of handling which are not described in the Manual, the Commissary Ledger Instructions, or elsewhere. These matters have to be learned by actual experience, and it is intended to cover them as fully as possible in this article. Some of the methods in force at the Mare Island Hospital may differ in slight details from those at other hospitals, and local conditions at the various stations are bound to result in slightly varying methods.

Provisions are obtained from three sources, as follows: First, directly from dealers with whom contracts are placed by the Navy pay office in San Francisco. These contracts are made for the general service, and also especially for the hospital. The hospital orders

all articles of food, such as potatoes, oranges, onions, general meats, bread, etc., on the same contracts as do ships at this station. In addition to this, certain articles of food which are required for care of the sick and which do not appear on the regular Navy contracts are contracted for by the Navy pay office "for hospital only." Every quarter the Navy pay office is furnished an estimate of the quantities of these items which will be required for the hospital during the ensuing quarter, and contracts are made from these estimates. The contracts are monthly, quarterly and yearly. Eggs, butter, cheese, fresh fruits and vegetables in season are contracted for monthly. Staple vegetables, such as potatoes and onions; fruits, as oranges, apples, etc.; meats, fish, bread and groceries are contracted for quarterly; milk, cream, and ice annually. The Navy pay office sends this hospital a memorandum showing the contractors for the various items, giving the prices and numbers of contracts. In cases of contracts "for hospital only" we usually receive a copy of the contract itself. It is the custom at this hospital to make each month what we term our "Memo. of contracts." On this we group all the contracts, showing first contractor's name and address, telephone, number of contract, and then a complete list of all the items obtainable on that contract, with prices. The object of this will be explained later on. Articles received on these contracts are obtained by placing orders directly with the contractors and are paid for monthly on public bills, the appropriation chargeable being "Naval hospital fund maintenance," or for the present, the new appropriation, "Care of hospital patients."

The second method of obtaining provisions is from the supply officer of the navy yard on provision requisitions. The stores obtainable from the supply officer are the dry stores and groceries, such as sugar, flour, tea, etc., and all kinds of canned vegetables and fruits. Requisitions are sent in on the special S. & A. Form No. 30, provided by the Bureau of Supplies and Accounts for the purpose, one white form and eight green copies being sent direct from the hospital to the supply officer. After the requisitions are filled they are priced and constitute their own vouchers, five priced copies being returned to the hospital for the receipt signature of the commanding officer, three receipted copies being returned to the supply officer. At this hospital we used to aim to obtain our provisions from the supply officer once each month, but since the mobilization and our increase in number of patients we have had to send in provisions requisitions twice each month, and sometimes oftener.

The third available source of provisions is the commissary store. Articles required are obtained from the commissary store on signed orders of the commanding officer, using an order blank similar to the one on which provisions are ordered direct from contractors.

From the commissary store it is possible to obtain many items that it would be impossible to get from any other source, such as special cereal breakfast foods, tinned shellfish, preserves, etc., which are useful and very desirable in serving many special diets and for the special messes. Each month the commissary store sends the hospital priced invoices covering issues during the month. These invoices are checked, two copies being receipted by the commanding officer and returned to the commissary officer.

Menus for seven days, from Monday to Sunday inclusive, are prepared each week. We usually make our bill of fare on Tuesday. It has been found very advantageous to work up a bill of fare by first arranging the dinners for each day, starting in with the meats and building around the main dish as we go along. By first deciding what meat to run for each day's dinner, it is easier to obtain a rotation in meats, and it also enables one to work in left-over portions for suppers and breakfasts. After the bill of fare is drafted it is sent to the chief nurse for such additions as may be required for the special diets, and it is then submitted to the executive surgeon and commanding officer for criticism; after approval by the commanding officer it is returned to the commissary officer. Smooth copies are now made in sufficient number for distribution to all who need them—the commanding officer, executive surgeon, chief nurse, diet kitchen, and other kitchens. The orders for provisions necessary to prepare this bill of fare are then made out. The memorandum of contracts above described is referred to and orders are made out to each contractor thereon from whom articles will be required. It is in the preparation of these orders that the memorandum of contracts is found so useful, it being much easier to go completely through a bill of fare, ordering all items thereon by reference to this memorandum, than it would be from the contract memorandums furnished by the Navy pay office on which the various dealers are not grouped together. The orders are mailed from the hospital not later than Thursday night, as some of them go to San Francisco, and they frequently contain orders requiring delivery on the following Saturday. These orders are always subject to change, such as increase, decrease, cancellation by telephone, or otherwise, as the needs of the hospital may change by large increases or decreases in the number of patients.

All provisions are received, weighed, inspected and checked in the commissary department. We keep what we call the "wagon book," which is a rough receipt and expenditure voucher. In this book are entered each day all receipts of provisions, together with actual weights, and a record of whether or not shipments are accompanied by duplicate dealer's invoices. These invoices should accompany each shipment. Weights are checked thereon, corrected where necessary. One invoice is returned to the dealer and one re-

tained for the hospital files. One of our chief difficulties is in getting the contractors to send us these invoices, and where same do not arrive either with the shipment or by mail the same day, we make out and mail to the contractor a receipt showing actual quantities delivered. Every morning the receipt and expenditure voucher for the previous day is prepared, and from this the commissary ledger is posted daily.

The commissary force at this hospital consists of the following personnel: Pharmacist, in charge; one nurse; one pharmacist's mate, first class; one hospital apprentice, first class, or pharmacist's mate, third class; and one civilian storeman. The nurse has charge of the storerooms and ice boxes, superintends the issues and drafts the menus. The assignment of a nurse to this duty has proved most satisfactory. The work is not easy, requiring long training to enable one to master all the details and learn where the biggest "leaks" and the most waste can be located. The nurses are not transferred as frequently as are enlisted men. In two years at this station we had five different chief pharmacist's mates detailed in the commissary department; they seemed to be transferred as fast as they mastered their jobs. This is fine from the point of view of training men, but does not result in the highest efficiency at a given point. Aside from this, it is believed that a trained female nurse, who is practical, is better qualified to manage a commissary department than the average man.

The cafeteria method of serving the convalescent patients' messes and the Hospital Corps' mess, which was described in the BULLETIN about three years ago, has been continued at this hospital and has proved very satisfactory. With proper equipment, including serving tables equipped with steam warming trays, it is believed that this system of messing would be the ideal one for all naval hospitals.

THE PREPARATION OF COLLOIDAL GOLD.

By FREDERICK G. SPEIDEL, Assistant Surgeon, United States Navy, and J. W. SMITH, Assistant Surgeon, United States Naval Reserve Force.

It is the consensus of opinion at present that an examination of spinal fluid is not complete unless subjected to Lange's colloidal gold test, in addition to a Wasserman test, a cell count, a test for increased globulins, and a bacteriological examination.

The purpose of the colloidal gold test is primarily to differentiate paresis, cerebro-spinal syphilis, and meningitis from one another, and as characteristic positive reactions make their appearance very early in the course of an invasion of the central nervous system by these diseases, the importance of the test is apparent.

Up to the present time its popularity has been greatly restricted by the difficulties attending the preparation of satisfactory colloidal gold solutions, and therefore any modification of technique in the preparation of this substance which will give a large percentage of successful results without unduly complicating the process arouses immediate interest.

A great many methods have been suggested for the preparation of this substance, but all workers agree that there are two factors of the utmost importance, namely, the cleaning of the glassware and the absolute purity of the water used.

Some of the methods that have been used in the preparation of colloidal gold are as follows:

Lange's method.[1]—Take 1,000 c. c. of fresh, doubly distilled water, add 10 c. c. of a 1 per cent Merck's gold chloride solution, and 10 c. c. of a 2 per cent solution of K_2CO_3. Heat rapidly to the boiling point, stir vigorously, and add 10 c. c. of a 1 per cent solution of formalin. The colorless solution must at once assume a clear port-wine color.

Eike's method.[2]—Take 1,000 c. c. of fresh, doubly distilled water, add 10 c. c. of a 1 per cent solution of Merck's gold chloride, and 5 c. c. of a 5 per cent dextrose solution. Heat to 90° or 95°, and then add a 5 per cent solution of K_2CO_3, one drop at a time, until the required color is secured.

Oetiker's method.[3]—Believing that failures in obtaining proper solutions were due to variations in temperature and the variable amount of the K_2CO_3 added in Eike's method, Oetiker proposed a modification in which he adds the gold chloride and dextrose solutions as in Eike's method, heats the solution to exactly 90° and without turning off the flame adds at once 12 c. c. of a 2 per cent K_2CO_3 solution.

Miller and Levy's method.[4]—One liter of water is heated to 60 C. in a sterile Jena beaker. At this temperature 10 c. c. each of a 1 per cent aqueous solution of gold chloride and a 2 per cent solution of potassium carbonate are added synchronously and thoroughly mixed at once. From this point the solution is heated as rapidly as possible to between 90° and 95° C. The flame is then turned out and, while the contents of the beaker are briskly agitated, 10 c. c. of a 1 per cent aqueous solution of formalin are gradually added. The previously clear colorless fluid at once undergoes a brilliant reaction, with reduction of the gold to a colloidal state, shown by the production of a beautiful play of colors.

Miller, Brush, Hammers, and Felton's method.[5]—A liter of water is heated to 60 C. and to it are added 10 c. c. of 1 per cent gold chloride solution and 7 c. c. of 2 per cent solution of K_2CO_3. At 80 C., while stirring with a clean thermometer, add slowly 10 drops

of 1 per cent oxalic acid solution. Continue heating until a temperature of 90 C. is reached, at which point the flame is withdrawn and, while stirring, 5 c. c. of 1 per cent formaldehyd is slowly added, a drop at a time.

Work in the chemical laboratory of the United States Naval Medical School indicated that with a very slight modification the above method gave almost perfect results. The modification is in the manner in which the oxalic acid is added. Instead of adding it drop by drop the 10 drops are added at once; the solution is allowed to remain still until a pink or purplish color develops in the area in which the acid falls; the solution is then quickly mixed. The solution has a faint pink tinge and is now raised to 90 C. and the formaldehyd added, as directed. The solutions prepared in this manner respond in an entirely satisfactory manner to the prescribed tests.

Numerous other methods have been described for the preparation of colloidal gold, such as replacing glucose or formaldehyd by other reducing agents, such as metol, hydroquinon, pyrogallol, acids, and others, but it seems that formaldehyd gives the most dependable results. Zsigmondy[6] suggested that a small quantity of a previously prepared colloidal gold solution be added just before the addition of the formaldehyd, the theory being that the tiny gold particles act as nuclei for condensation and grow in the reducing mixture. This method produces beautiful solutions, but solutions which were in no way superior to those made by a method to be described below, and very often were found to be "protected."

A glance at the above methods will show that perfectly satisfactory solutions can be made by a variety of methods and with varying quantities of each ingredient, but no author states that his method will produce other than a "majority" or a "large percentage" of successful results. In order to determine the effect of each factor in the process Black and Rosenberg[7] conducted a series of experiments, using the method of Miller, Brush, Hammers, and Felton[5] with the exception of one factor—all other conditions remaining constant—and variations of this one factor were used to determine its influence on the character of the solution.

Reducing their observations to a basis of 1,000 c. c. it was found that the amount of 2 per cent solution of K_2CO_3 could be varied from 6.25 c. c. to 7.25 c. c. and still obtain beautiful solutions without shimmer and neutral in reaction. Likewise they found that the 1 per cent formaldehyd solution could be varied from 4.5 c. c. to 20 c. c. with similar good results. The method of heating was found to be of great importance. If heating has been slow and the formaldehyd is added before the boiling point is reached, vaporization of

the formaldehyde will be excessive, resulting in incomplete reduction and alkalinity.

In view of the above, it was believed that the method of preparing colloidal gold solutions in use at the United States Naval Medical School could be greatly simplified and still maintain a high percentage of good results. Therefore after a large number of trials we have adopted the following method, which we give in detail, as we believe that by carefully following the directions, satisfactory solutions can be prepored at any naval hospital laboratory.

Glassware.—New glassware should be used, and, of course, should not be used for any other purpose. It is first cleaned with hot soapy water and then rinsed with aqua regia. After this all flasks, pipettes, etc., are competely filled with tap water several times to drive out all traces and fumes of aqua regia and then rinsed with distilled water, and just before use with triple-distilled water. We found that the following glassware is all that is necessary in the preparation of colloidal gold: Three 100 c. c. volumetric flasks, one 100 c. c. pipette, one 10 c. c. pipette, one 10 c. c. graduated pipette, one 5 c. c. graduated pipette, and several 2-liter Erlenmeyer flasks. The pipettes should be reserved for only one solution each and they should not be interchanged. If this rule is followed, a simple rinsing with triple-distilled water before making each solution is all that is necessary, and the initial cleaning with aqua regia need only be repeated at long intervals.

Water.—All water used in the preparation of the stock solutions and the reagent itself must be triple distilled. A block-tin condenser is used, and rubber connections must be avoided. A very satisfactory condenser can be made from a piece of block-tin tubing about 60 cm. long bent in the form of an inverted U, with one long arm and one short arm. The short arm is passed through a tinfoil-covered cork into the distilling flask and the long arm is surrounded by a glass or metal cooling jacket, through which water circulates. The lower end of the tube is passed into a flask placed to catch the distillate.

To the second distilled water is added a small quantity of sodium carbonate (about 1 gm. per liter). We believe this to be very important, as it frees the water from all traces of ammonia that may be present due to absorption of the gases in the laboratory and, as a further precaution against impurities, the first 50 to 100 c. c. of the third distillate is discarded.

Solutions required.—1. Gold chloride (Merck's) 1 gm., water (triply distilled), up to 100 c. c. 2. Potassium carbonate, 2 gm., water (triply distilled), up to 100 c. c. 3. Formalin (40 per cent formaldehyd), 2.5 c. c., water (triply distilled), up to 100 c. c.

Preparation of the colloidal gold solution.—Place 1,000 c. c. of triply distilled water in a 2-liter Erlenmeyer flask. (A large flask facilitates vigorous agitation at the end of the procedure.) Add 10 c. c. of 1 per cent gold chloride solution and 7 c. c. of 2 per cent potassium carbonate solution. Place over a Bunsen burner and heat rapidly to boiling. When the boiling point is reached, as evidenced by the rising of bubbles, remove from the flame and with constant agitation add 4 c. c. of 1 per cent formaldehyd (2.5 per cent formalin) solution. Continue to agitate vigorously and the solution will be seen to assume a faint bluish tinge and pass rapidly through a deep amethyst to a beautiful red color, which indicates that reduction is complete. This is the final product, and it should conform to the following requirements:

1. The solution must be absolutely transparent and preferably of a brilliant red-orange or salmon-red color.

2. Five c. c. of the solution must be completely precipitated by 1.7 c. c. of a 1 per cent solution of sodium chloride in the time interval of one hour.

3. The solution must be neutral in reaction.

4. It must give a typical reaction with a known paretic cerebrospinal fluid.

5. It must produce no reaction greater than a No. 1 with known normal cerebrospinal fluid.

If a solution results that is unsatisfactory in any of these particulars, it should be discarded, and, after a careful and thorough recleaning of all glassware, another solution made up. This procedure, in our experience, has always resulted in a satisfactory solution, and takes less time and is less trouble than trying to "correct" a poor solution.

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HISTORICAL.

THE MEDICAL SCHOOL OF SALERNO, 848 A. D.–1811 A. D.

Eleven leagues south of Naples the ruins of an old Norman castle look down upon one of those deserted, neglected, provincial towns so common throughout Italy, which, though half forgotten now, wielded in their day an influence that reached to the confines of Europe. The town walls have been replaced by a public promenade, and the fine harbor constructed by John of Procida in 1260, though cleared now of obstructing sand, is visited only by fishing smacks and excursion steamers. The lion of the place is its cathedral, dedicated to St. Matthew, whose bones were brought here from Paestum in an age when lies, theft, and murder were none too big a price to pay for much coveted sacred relics; when the fierce struggle for such possessions exceeded anything that later generations can show, even among collectors of stamps, coins, porcelains, or old masters. The church was begun by Robert Guiscard, as a compensation, perhaps, for the damage done to the town after his eight months' siege or else to add to the beauty and dignity of the capital of his new dominions, and it was consecrated by the immortal Hildebrand in the days when he was supreme and little dreamed that for having "loved justice and hated iniquity" he would one day come back an exile to die and be buried in Salerno.

Salerno was founded by Rome in the second century B. C., as a bulwark against the Picentini. In the Social War it was captured by the Samnites. It began to assume real importance during the Lombard invasion. After the death of Charlemagne, who had dismantled it, the town rose again stronger than ever, and became, owing partly to its extensive fortifications, a powerful principality, rivaling Benevento and able under its Lombard princes to withstand more than one attack of Saracen pirates.

De Renzi[1] says: "Everyone knows that the Goths who came to Italy in the fifth century left largely undisturbed the ancient civilization of these unfortunate people; the Longobards alone, Germanic in race, brought with them destructive barbarity. However, the Longobards were not able to flood the whole of Italy, and some cities either remained Latin, as did Rome, or Greek, as did Naples. * * * The

[1] Storia Documentata della Scuola Medica di Salerno, G. Nobile, Naples, 1857, p. 101.

people of Salerno, having preserved their independence of Lombard dominion for 76 years were able to maintain their institutions, their schools, their Latin customs * * * Little by little Italian civilization softened the Longobards as their fury began to be spent * * * It is in this way that Salerno which only passed into the possession of the Longobards after this metamorphosis had taken place was able to retain so great a portion of its Latin culture." Its civic power waned when Henry VI sacked it and transferred the court to Palerno. The first Napoleon closed its university and so severed the last link which bound Salerno to "the glory that was Greece and the grandeur that was Rome."

But Salerno still possesses what neither the Teuton invader nor the tooth of time can take away, a beautiful location and a salubrious climate. The guide-books assure us, too, that good wine is produced in the neighborhood.

Appulus (180 A. D.) writing in verse says: "There is no pleasanter city of Latium than this one, abounding with fruits and trees and wine; not lacking in apples and nuts. It has beautiful buildings. Striking women and upright men adorn it. Standing half on the hill and half on the plain, it is supplied with everything by land and sea."

Gilles de Corbeil was full of tender memories of his alma mater. His writings abound with references to the college and throw many sidelights upon the character and work of the school. He speaks of Salerno as sacred to Apollo and the faithful guardian of Minerva. He extols the beautiful site of Salerno, washed by the waves of the sea and climbing the hillside, rich in herbs, marvelously powerful to heal. He refers to the physiology and anatomy taught there; describes the system of instruction; mentions public lectures by the faculty, and describes the solemnities connected with the conferring of degrees.

It may be in large measure due to the location and climate that there developed at Salerno a medical school which has a permanent place in the history of human progress. The exact date of the founding of this institution is unknown, for the reason perhaps that no pope or emperor created it by fiat, but that it gradually came into being, a product of local needs and conditions.

De Renzi states that the origin of the school of Salerno is "as obscure as the sources of the Nile." He denies emphatically the suggestion that the school owed its origin to Arabian or Saracenic influence, pointing out that in the early period the only contact was with Saracens of rough, piratical type, and not with the cultured Moors; and he is at some pains to disprove the assertion that the school was organized by Constantine Africanus. He places the birth of the school at the middle of the seventh century. The earliest physician

alluded to in connection with the school of Salerno is Joseph, A. D 848. In the manuscripts of his day he is styled *Iosep Medicus.*

Daremberg[1] says that the texts of the tenth and eleventh centuries already referred to the school as very ancient. The Neapolitan archives furnish names of Salernitan physicians as early as 846 A. D. He admits, as De Renzi claimed, that Salerno did not begin as a guild nor as a secret society, and also corroborates De Renzi's assertion that it had a lay origin, though owning that the influence and assistance of the Benedictines of the neighborhood was considerable.

From very remote times people went to Salerno for their health. As early as the close of the seventh century a monastery was established there by the Benedictines, and, if not directly organized by them, their presence and their rule of charity and good works prepared the way for the college. In 820 A. D. a hospital was built at Salerno, and the members of the order had a share in the control of other benevolent institutions that gradually grew up around it, among which may be mentioned the large infirmary of the Sisters of St. George.

A powerful impulse was given to hospital construction by the Crusades, and in the course of time there were at lease five hospitals in the city, one of which was administered by the Knights of St. John of Jerusalem. Sufferers were thus attracted to Salerno, and naturally physicians of ability began to settle in so promising a field. By the close of the ninth century Salerno was already famous for its physicians, some of them being originally from remote parts of the peninsula, as was true in the case of Ragenifrid of Lombardy, the medical attendant of the Prince of Salerno. Patients of distinction now flocked to Salerno from all over Europe. Bishop Adalberon in 984 A. D. sought health there in vain, but Desiderius, Abbot of Monte Cassino, came and was cured by Constantine Africanus. A warm friendship sprang up between these two great men, one of whom became a pope with the title of Victor III, while the other eventually retired from Salerno to enter the monastery of Monte Cassino and there continue his labors both as healer and writer. Duke Guiscard sent his son, Bohemund, made famous by Tasso, to Salerno to be cured of a wound received in battle which had refused to heal under the ordinary surgical treatment of the time. The Duke of Normandy, later known as William the Conquerer, spent some time at Salerno for a similar reason. Some authorities insist that it was not William but his son, Robert, who sought healing from the wise physicians at the famous seat of learning. Legend and romance cluster around the visit of Robert of Normandy to Italy. It is accepted as a fact that he went there and was suffering at the time

[1] Introduction to C. M. St. Marc's "École de Salerno," Baillère, Paris, 1880.

from a fistula and a chronic discharge due to a poisoned arrow. It is scarcely to be believed, however, says De Renzi, that the wise doctors of Salerno would declare that a cure could not be obtained until the poison had been sucked from a wound of such long standing, and we must reject the pretty story of how Robert generously forbade such an attempt on account of the danger to the sucker, and how his beautiful young wife took advantage of an occasion when the duke was asleep to perform this heroic cure at the expense of her life. This and other stories seem to have grown up through an attempt to explain the origin of the dedication to the King of England of the famous "Regimen sanitatis Salerni."

The ancient chronicles of the city ascribed the actual founding of the Salerno school to four doctors, a Jew, a Greek, an Arabian, and a native of the town, who lectured, each in his own language. This origin is doubtless mythical but lends weight to the modern opinion that the medical school had its actual beginning in lay rather than clerical sources.

By the eleventh century a regular medical curriculum, with standard requirements, was in full activity, and Salerno had become the medical center of Europe. Not only did patients flock thither, but quacks and charlatans came as well, ready to profit by the ignorance of patients or the failures of the recognized luminaries in the profession. It became necessary to protect both the sick and the regular practitioner from the fraudulent claims of such parasites. In 1140 A. D. we find Roger II of Sicily promulgating a law to regulate the practice of medicine in his dominions. He required an examination by officials and judges. Anyone attempting to prescribe without proper license was liable to a year's imprisonment and the confiscation of his property. A century later Roger's grandson, the illustrious and learned Frederick II, required candidates for a license to undergo a public examination by the faculty of Salerno. The examination covered the teachings of Hippocrates, Galen, and Avicenna. No one was eligible for the examination unless he had enjoyed three years of premedical instruction, four years' study of medicine, a year's instruction under a licensed physician, and a year's special study of anatomy in case he desired to specialize as a surgeon. The enactments of the great Hohenstaufen ruler fixed the fees for office and house calls and also undertook to regulate the drug trade by defining the relation of doctor and druggist, creating inspectors of drugs, etc. A far more radical and significant feature of Frederick's law was the provision for the dissection of a human body before the assembled faculty and student body at least once in every five years. On the other hand, De Renzi claims that no edict of the time of Frederick II provides for dissection once in five years, as has frequently been stated, but that this monarch merely legalized the dis-

section of the human body. If the practice was rare it was due to the difficulty of obtaining material for dissection and Salerno should be credited with the distinction of having made a beginning in this essential branch of medical education.

However little of positive progress in medicine and surgery we may be willing to ascribe to the school of Salerno, we are already in a position to recognize that it accomplished two things. It bridged the gap between the decline of Greek and Roman medicine and the period of distinct advance in the fifteenth and sixteenth centuries. More important still, it emphasized the need, which, according to modern notions, it may indeed have supplied in but a limited measure, of adequate study and preparation before venturing to minister to the ills of the flesh. If disposed to minimize the actual professional attainments of the Salernitan school, we should remember that it is only within the last decade that premedical education has been generally insisted on in our own country. The school of Salerno stood for the best scholarship possible in its day and aimed to turn out men who had developed habits of thought and observation and powers of reasoning and were able to meet on a footing of intellectual equality the best-born patient who might seek their services, and it was for three centuries the great source for the dissemination of medical lore throughout Europe.

There are other respects in which Salerno has a right to command the admiration of this generation, which we deem to be characterized by liberality of spirit and a strong trend away from unnecessary dosing. Until the Salernitans came under the sway of the Arabian school hot and cold baths, heat and cold, fresh air, diet, exercise, and simple therapy were preferred to complicated pharmaceutical remedies, though they had an extensive materia medica, which included iron for enlargement of the spleen and sea sponge for goiter. Salerno must be credited, too, with careful, honest observers and recorders of natural phenomena and a forceful simplicity and directness in marked contrast with the scholasticism and pedantry of Arabia. The Salernitans have left us worthy descriptions of intermittent fever, pneumonia, psoriasis, lupus, and phthisis. In the treatment of incipient phthisis they recommended an easy life in the open air and appropriate diet.

Peter Musandino, 1160, writes about the preparation of appropriate food and drink for the sick, a matter we consider so important to-day, and which has for its practical exponent the diet kitchen found in every up-to-date hospital.

When the diet nurse of to-day puts the climax to her culinary endeavors by serving the carefully planned meal on a dainty tray whose mere appearance shall stimulate the patient's flagging appe-

tite, she is only carrying out the ideas elaborated eight centuries ago by this wise clinician, who insisted on the value of dishes and crockery that pleased the eye. Musandino appreciated the psychic element in treatment and knew full well that the sick must often be humored and cajoled. If a patient was really going to be injured through chagrin and disappointment at not having the accustomed wine with his meals, Musandino gave him a substitute for wine undistinguishable to the taste from the objectionable alcoholic and he generously supplies to his readers the formula for its preparation. Merely to read, during the course of a long day's research amid library shelves, his description of a boneless chicken in jelly would stimulate the salivary glands of the veriest bookworm.

Once again we are compelled to recognize that the Salernitans were working on sound lines, though their actual results may harmonize little with our modern conceptions. Corbeil refers to Musandino as an authority of great learning and high standing.

The Salernitans appreciated the unfavorable prognostic to be derived from the supervention of chronic diarrhea in phthisis. The employment of wine as a topical application for open wounds shows a practical if empirical attempt to render wounds clean. It is remarkable, as noted by Dr. Walsh, that, in a country where the heating of dwellings has never been in vogue, the necessity of a warm and unirritating room temperature was insisted on for sufferers from pulmonary affections. There has been a disposition to belittle the surgery of Salerno, reserving any encomiums for the work accomplished strictly to medicine, yet, from the circumstance that both sutures and ligatures were advocated there for the arrest of hemorrhage, we must conclude that the subject was far from neglected.

In a work of Peter Clericus (A. D. 1035) appear these words: "If too much blood shall have been poured out and consequently the man become exhausted, you will tie the vein itself and wash with wine and water * * * and by means of a needle you will draw a double thread under the vein itself and thus will tie in two places the vein itself; and then cut between the two ligatures."

Dr. J. J. Walsh in his entertaining work Old-Time Makers of Medicine (Fordham University Press, New York, 1911) explains very logically how these measures would come into use and be discarded again and again. In the absence of antisepsis and asepsis, infection was a frequent accompaniment of wounds, with resulting secondary hemorrhage and its deplorable consequences when vessels were tied. The actual cautery, on the other hand, was a clean hemostat.

Here and now in America, when women are acquiring suffrage rights, seeking not only higher education and a wider sphere of activity in intellectual fields but political power and participation

in the public life of town, community, and state, we can not fail to recognize how far in advance of its time was Salerno in opening its doors to women. They were eligible for the doctorate and for license to practice, not only in a special field but in all branches, even surgery, if they so elected. This was in accord with precedents established by Greece and Rome, as we know from inscriptions and manuscripts and the allusions of ancient writers, both lay and medical. The name of more than one "lady doctor" of eminence has come down to us, and of all the "sweet girl graduates" of Salerno none attained greater fame than Trotula, who flourished about the middle of the eleventh century. She appears to have been at the head of the women's department, and the author of at least two works dealing mainly with obstetrics and gynecology. In them are found directions for the prevention of perineal lacerations, for the treatment of procidentia uteri, for the operation of perineorraphy, etc., and rules for the hygiene of the puerperium, the selection of a wet nurse, as well as for the routine management of labor. She wrote, too, on the removal of freckles, and about how to get rid of superfluous flesh, and other matters of moment to women. The sufferer from increasing embonpoint was advised to take sand baths on the seashore under the rays of the noonday sun.

Trotula's reputation became coextensive with Europe, and the magic charm that attached to her name endured for 200 years. She was married to Platearius, a medical writer of note, and had a son and a grandson in the medical faculty of Salerno. Among the women who followed her were many capable practitioners and writers. They discussed such subjects as "Crisis," "Black Bile," "The Cure of Wounds," "The Embryo," "Urine." Salvator Calenda, dean of the faculty in 1415, later professor in the University of Naples, had a daughter, Constance, who is mentioned not only for her beauty but as having distinguished herself by the unusually high marks she obtained in her examinations in medical subjects at Salerno. These Salernitan dames were not without a spirit of mischief and fun, and sometimes put their learning to uses scarcely professional, as when they powdered roses with euphorbia and gave them to young gallants to smell with a view to enjoying the violent sternutations that resulted.

Up to the end of the eleventh century the masters of Salerno were without competitors except among the clergy. From then on we find a growing disposition on the part of the church to forbid the practice of medicine by the clergy. Such practice had begun as a charity, but had become increasingly indulged in because of the emoluments acquired and the increased liberty which it permitted. The church realized that the systematic practice of medicine diverted priests and monks from their legitimate religious work. Attention

was given to this matter by the Council of Rome, by the Council of Rheims (1135), the Second Lateran Council (1139), the Councils of Montpellier (1172), Tours (1172), Paris (1212), and the Lateran Council of 1215 (III).

The decay of Salerno began with the growth in political importance of Palermo and Naples, and it ceased to set the standard for things medical after the medical school of Bologna came into prominence through the native genius of Hugo of Lucca, a man whose lack of erudition was counterbalanced by originality and industry. Hugo was followed by Theodoric and other men of a like stamp, and, northern and central Italy having become infused with new ideas from Arab sources, Bologna rapidly forged ahead in popular favor while Salerno came to be regarded as stagnant and effete. Though the schools of medicine at Naples, Montpellier, Bologna, and Paris grew to be rivals of the school at Salerno, and finally threw it completely in the shade, the effect of Salerno's liberality toward women left a permanent impress upon Italy, where learned women were numerous and conspicuous even before the Renaissance, before the days of Isabella d'Este and Vittoria Colonna. Bologna replaced Salerno as the center for professional study for women, and counted in its faculties of medicine and law many a soft-voiced teacher of talent and renown. Among them one had, in addition to learning, a face so beautiful that it was deemed expedient to have her lecture from behind a curtain!

It was at Bologna under Mondino that the study of human anatomy was systematized and assumed its proper place in the medical curriculum, though both at Salerno and Venice the importance of this subject had at least been recognized. At Bologna the enthusiasm for anatomical research reached a high pitch. The regulations of the university required the teachers to "dissect for students if they acquired a body for that purpose." In 1319 four students, one from Piacenza and three from Milan, were arrested and tried for body snatching. They had gone to a cemetery outside the city gate, disenterred, and removed the body of a criminal executed a few days before.

A slight diversion may be permitted here to advert to a pathetic little romance which sheds its sweet fragrance over the dry chronicles of the fourteenth century. Among Mondino's assistants were Alessandra Giliani and Otto Agenius. The former began her university career by a study of philosophy and then specialized in anatomy. Her skill won her the position of prosector. She had the reputation of being able to "cleanse most skillfully the smallest vein, the arteries, all ramifications of the vessels without lacerating or dividing them, and, to prepare them for demonstration, she would fill them with various colored liquids, which, after having been

driven into the vessels, would harden without destroying the vessels. Again, she would paint these same vessels to their minute branches so perfectly and color them so naturally that, added to the wonderful explanations and teachings of the master, they brought him great fame and credit." This rare maiden died in her nineteenth year of too strenuous application to her work, as evidenced by the commemorative tablet set up by her fiancé and associate under Mondino, Otto Agenius, the first assistant in anatomy, a man of unusual ability and zeal, who himself died suddenly at about 30. The epitaph describes him as left inconsolable by the taking away of "his better part and excellent companion."

But to return to Salerno. Here anatomy had been taught, mainly by dissection of pigs, and Copho's Anatome Porci was a well-known book in its day and served as a sort of compend of dissection. Copho was a Jew, and this race gave not a few teachers of distinction to Salerno, a circumstance which illustrates the enlightenment and liberality of the Civitas Hippocratica.

Another work emanating from Salerno which had great vogue in its day was a rhyming Latin poem, a compendium of suggestions on health, the "Regimen sanitatis Salerni" or "Schola Salernitana," ascribed perhaps erroneously to Joannes de Meditano as author.[1] It was intended for the laity and dedicated to a "King of England" about whose identity there has been no inconsiderable discussion, and was first edited and published by Arnold of Villanova in the thirteenth century. Of the popularity of this work we may judge from the fact that it was translated into almost every language of Europe and went through 240 editions between 1484 and 1884. There are at least 100 extant manuscript copies of the work. In the library of the Surgeon General of the Army in Washington there is a whole shelf devoted to copies of the printed work, the most ancient of which dates to 1507. In the opening lines of this classic we see a reflection of the eclecticism and liberality as well as the good sense and simplicity which marked the best period of Salerno. There is a hint of modesty, too, always lamentably rare except in the very ablest and noblest representatives of the profession. The tyro who complains that Osler's Practice of Medicine, which has been the model for so many later works, is deficient in the matter of treatment would perhaps see nothing charming or fine in the words:

> Si tibi deficiant medici, medici tibi fiant
> Haec tria: mens laeta, requies, moderata diaeta,

[1] The authorship of the Regimen Sanitatis has also been ascribed to John of Toledo, who is supposed to have epitomized an earlier composition and dedicated it to a Spanish princess. In some texts the dedication of the Regimen is to the King of the French, in others to the King of England.

which might be translated:

Should a dearth of doctors be
Let thy healers be these three:
Happiness and lasting quiet
And an ever moderate diet.

Still another book, the output of Salerno, always a prolific source of medical literature, is entitled "The Coming of a Physician to His Patient, or An Instruction for the Physician Himself," which gives valuable suggestions for the development of the proper bedside manner, as vital a detail to-day as it was when the unsuccessful physician was liable to mutilation or imprisonment at the hands of a patient of high degree unless he had won that patient's personal regard. The author must have been a strong believer in suggestion and have appreciated fully the rôle of the depressing emotions, for he urges the wisdom of having the patient confess and receive the sacrament before the physician's visit, lest, if these important steps were taken after it, the sick man should assume that an unfavorable prognosis had been given. The doctor is enjoined always to assure the patient of his recovery, even when it is necessary to speak less hopefully to relatives and friends. It is directed that on the way to the sick man's dwelling the messenger who summoned the doctor be questioned about all the details of the case, so that, even if a study of pulse and urine fail to supply a diagnosis, the sufferer may be duly impressed by his attendant's ready grasp of all the symptoms. The learned Trotula also had an eye to business or could not quite vanquish feminine proclivities, for she inserted in one of her books a chapter on cosmetics.

Among the justly famous alumni and professors of Salerno was Gilles de Corbeil, better known as Aegidius Corboliensis, a popular writer on medical topics, already referred to, who was partial to verse and employed hexameters as his vehicle of expression. His poems on the urine (sic) and the pulse were long regarded as medical classics. We are not surprised to learn that a man of his refined taste eventually became court physician to Philip Augustus, of France.

The art of preparing drugs had reached a high degree of complexity at Salerno, even when the general plan of treatment was mainly dietetic. Nicholas Præpositus, a master of the school at Salerno and at one time its dean, who flourished in the middle of the twelfth century, was the author of a compend of pharmacy, the Antidotarium, officially recognized and used in Salerno for centuries. It contains what is probably the first extant reference to anesthesia produced by inhalation for undergoing operations. The device in question was spoken of as "the soporific sponge." A

sponge was saturated with the juices of opium, hyoscyamus, mandragora, lettuce, etc., and then thoroughly dried. Just before applying it to the patient's nostrils the sponge was steamed or dipped in hot water. The Antidotarium was among the earliest of printed books, appearing in German in 1472 and in Latin in 1480.

If the fame of Salerno had markedly declined by the middle of the fourteenth century, its influence was still strongly felt in southern Italy, during which period we find a master of this school attaining a position of prominence as a writer and sanitarian—one Saladin of Ascoli. Saladin addressed a memorial to the Prince of Tarentum, whose physician he was; a little work on the subject of druggists and compounders of medicine, in which he refers to the official treatise on drugs by Nicholas Præpositus. He claims to have written at the instance of many druggists, and deplores with them the ignorance which prevailed in that branch. His work describes in detail the method of weighing and determining the dose of drugs, gives a list of what may be called the official preparations, outlines the examination which druggists should be able to pass in order to be licensed, speaks of the method of gathering plants, flowers, roots, etc., and of the appropriate seasons and months for so doing, telling how they should be preserved and put up and, finally, describes the proper method of installing and conducting a drug store. In summing up his description of an ideal dispenser, Saladin says that he should be not too young and not given to women, wine, or gambling; he should be studious, attentive, upright, kind to the poor, learned, and full of the fear of the Lord; he should not be too keen for gain, but consider that he has in his hands not only the reputation of physicians, but the lives of their patients; he should not dispense poisons nor sell drugs intended to bring on abortion; he should be sure that the prescription conforms to the intention of the physician who wrote it, and, if it contains dangerous or bad-tasting ingredients, he should consult with its author before putting it up; he warns him against substitution, and against selling articles which have been kept on his shelves too long and have become inactive, such as hard, insoluble pills. In all this, Saladin appears to have followed the traditional teaching of the school of Salerno.

The Salernitans were always men of learning; they were often of good family; were employed for the performance of civic functions of the highest order, and had the full confidence of the rulers of their day. Matthew Solomon (twelfth century), a Jew, a master of Salerno, was called to a professorship in the rising school of Montpellier. Romualdo Guarna (twelfth century) served as foreign ambassador; sat in the general Lateran council, 1179; accompanied Pope Alexander, and represented William I at the draw-

ing up of the treaty of peace with Frederick Barbarossa. He was elected Archbishop of Palermo. He was twice called upon to treat the King of Sicily in Palermo. He ascribed the death of the King to the patient's intractability—"he took only the medicine which appeared to him appropriate." Romualdo was famous for his medico-legal knowledge and was called on for expert investigation and testimony in a famous poisoning case. He wrote a history of the world from the creation to the year 1178.

Another Jewish physician of note was Ferraguth, a native of Messina, physician to Charles I of Anjou.

John of Procida was born at Salerno about 1210. He was intimately associated with Frederick II, serving as his physician for about 10 years, and was tutor to Manfred. He attended Frederick in his last illness. John suggested improvement of the port of Salerno and established an annual fair which continued to be held down to the present era. After the battle of Benevento, John is believed to have practiced medicine in Rome. During his sojourn there he cured Cardinal John Gaetani (later pope with the title of Nicholas III). He attended the ruling pope, Clement IV. He is believed to have taken part in the battle of Tagliacozzo, 1268, when Conradin was defeated by Charles of Anjou. We next find John of Procida at the court of the King of Aragon, where he entered the service of Constance, daughter of Manfred, who had married Peter of Aragon. When Peter succeeded his father on the throne of Aragon the acquisition of Sicily began to be seriously considered and John of Procida became one of the prime movers in this undertaking and devoted the remainder of his life to furthering the political interests of Manfred's daughter, Constance, and of her husband and children. We find him making repeated journeys between Italy and Spain, sometimes disguised as a monk, personally invoking the aid of the Emperor at Constantinople and of the Pope in Rome, plotting in Naples and Sicily, and present in the latter country at the time of the Sicilian Vespers in 1282. He played the part of the statesman while the famous admiral, Roger di Lauria, represented the military arm of Aragonese enterprise. John of Procida died at an advanced age (88?). He was the author of one or more medical works, which have been lost, and of two medical formulas which continued to be widely employed in Italy for four or five centuries.

Mention should be made of the Salernitan, Marzianus, the favorite physician of Frederick II when still a young man. It is believed that it was at the instance of this physician that Frederick put forth his well-known enactments regarding the study and practice of medicine in his dominions.

The famous astrologer and physician, Michael Scott, who lived at the time of Frederick II, and is referred to by Dante, etc., is believed by some authorities to have been a pupil of the Salerno school and to have practiced medicine in the Kingdom of Naples, on the strength of his many references to southern Italy and of the fact that the name Scotto was not an uncommon one at Salerno during his period.

The use of staphysagria delphinium for pediculosis capitis is recommended in the Catholica of Master Salerno, who flourished at the close of the twelfth century. He appears to have been the author of four works, two on thereapeutics, one on surgery, and the Caholica. All but the latter have been lost.

The Catholica has paragraphs devoted to a large variety of subjects. In regard to headache it is explained that the cause may be local or general, and in the latter case hard to determine and remove. The author associates different forms of headache with congestion or pallor or jaundice, torpor of the liver, etc., and takes into consideration the character of pulse and urine. He gives a description of epileptic attacks, and, under treatment for this disease, mentions production of emesis, catharsis, a low diet, scant in meat and fat, the avoidance of excitement and disturbing emotions.

In discussing stone in the kidney and bladder the author says that the physician must determine the source of the blood in hematuria; that if blood comes first and urine afterward, the source is the bladder. If the urine comes first and then the blood the latter represents hemorrhage in a remote organ. If blood and urine are thoroughly mixed, the bleeding is from the region of the loins. The causes of abortion are classified. Wine is recommended for local application to wounds. Fistulæ which do not heal with simple treatment should be cut in their entirety. The Catholica contains elaborate pharmaceutical directions and references to many remedies. It is to be noted that "aqua pluvialis" is invariably ordered in compounding. When under the head of threatened abortion, after discussing the various features present in the urine, he advocates reducing the diet, he shows himself the prudent and discerning physician by adding that this should not be as freely done as if the patient were not pregnant. Again, when prescribing venesection, he reminds the reader that the amount of blood abstracted must be proportioned to age and strength of the patient.

That Dr. Salerno had a sublime faith in the virtues of his pharmacopoeia may be judged from his furnishing a formula "ad vulvam restringendam ut virgo videatur mulier." A human and masculine note appears in the apparent slur on the lady practitioners of his vicinity, contained in the words "De omne ornatu faciei secundum notitiam salernitanarum mulierum que multum indigent."

At the beginning of the fourteenth century a work entitled "Glossæ Quatuor Magistrorum" began to be extensively quoted and referred to by medical writers of that time. It is nothing more than a series of comments on the work of Roger, surgeon of Salerno. This work has been the subject of much discussion, but it would appear reasonably certain that it was originally corrected and published by Guido di Arezzo. The four masters were probably the four regents of the school of Salerno who had seen fit to put forth in manuscript form a summary of the surgery of their school, of which Roger was the chief exponent. Roger belonged to a distinguished family of Salerno frequently mentioned in the city archives in the eleventh and twelfth centuries. There has been much confusion and discussion about his identity and time. His work is marked by originality and courage.

Roger was an astute observer of character as well as of the materies morbi. He refers to the difference in the requirements of rich patients and poor ones, and suggests modifications in the doctor's conduct to suit each class, though in no spirit of contempt for the destitute. He describes the rich as being delicate and fastidious and desirous of recovering in comfort and luxury. The poor, on the contrary, have little money to spend and care not for the taste of a medicine, provided it will enable them to get back to their work promptly. Therefore, the inexpensive and drastic remedies are for them. Their sirups may be made from honey, while the well-to-do will require sugar.

He treated quinsy by rupturing with the finger or by incision and believed in keeping open penetrating wounds of the chest to avoid collections of blood and pus. In wounds of stomach or intestine he advocated suture with thread; for the latter, suture over a tube of elder bark (sambucus nigra), which has hydragogue and cathartic action. In malignant tumors of the cranium with caries of bone, he used the trephine, and boldly removed the tumor with all its attachments. Roger was the author of a treatise on venesection. He showed marked ingenuity in the treatment of arrow wounds and laid great stress upon the danger of lacerating the tissues by the incautious extraction of barbed arrows. His practice was to endeavor to cut off the barbs by the use of forceps introduced along the shaft of the arrow or else by passing a metal tube of sufficient caliber to include the barb to the bottom of the wound and then withdrawing tube and arrow together, like a cannula and its trocar. He describes three varieties of fistula. In treating hernia of the lung, he avoided enlarging the wound for fear of damaging the lung tissue, and employed the following method of reduction: Traction was made on the skin above and below the hernia; the skin was drawn over the hernia and gentle pressure applied, patient being in the

erect position. At a given signal the patient was directed to sit down rather quickly in the hope that the jar thus produced, combined with external pressure, would effect reduction. Roger was reputed very successful in the performance of lithotomy, in which he followed closely the directions of Celsus. He lived at a time when Italy had become an important center for all the movement of large bodies of men connected with the Crusades. The shipping of Genoa, Venice, and Pisa afforded transportation to the Crusaders, who often spent considerable time in Italy, both on their way to and returning from the Holy Land. They came back sick and wounded and often brought with them marvelous accounts of the work of Saracen surgeons and physicians, and new methods, new instruments, new remedies.

Bruno of Longoburgh lived a little later than Roger, but surpassed him in originality and achievement. He based his writings and practice not only on the work of Greeks and Arabians, but on the result of his own observations and experience. He considered wounds with regard to their size, shape, situation, and depth, and held that the first indication for treatment was the arrest of hemorrhage, next the production of suppuration (what we would call drainage and flow of lymph), and, third, the regular and compact regeneration of tissue. He writes with great accuracy of the treatment of fractures and dislocations. He discards the barbarous mechanical devices of the time for reducing luxations, preferring the arm of a vigorous assistant. He is the first among Christian surgeons to discuss castration, and prefers in this operation the knife to compression. Bruno marks the period of transition from the tenets of the conservative, classic school of Salerno to the more progressive and eclectic school of Bologna, represented in its first period of fame by Hugo, Theodoric, and others.

With the introduction of Arabian influence into the practice of medicine in Italy there was a disposition to regard the manual operations of surgery as beneath the dignity of a learned physician, but this tendency was opposed by the energy and individuality of such men as Bruno, Hugh, and Theodoric. In spite of them, however, we know that for a long time after them surgery as a handicraft fell into the hands of barbers and ignorant men. The tendency of the Arabian school was to treat surgical affections medically. How different this idea from that which prevailed at Salerno, where a whole year of additional study was required from those who desired to specialize in surgery.

From the time of Frederick II and through the period of dominion by the houses of Anjou and Aragon frequent laws were passed which related to hygiene and sanitation in the Kingdoms of Naples

and Sicily. While giving due credit to the broadmindedness and energy of Frederick and his successors, a consideration of how such enactments are secured in our own day justifies us in ascribing these laws to the influence of the school of Salerno, through its many representatives at court and through masters of that school everywhere held in high esteem for their integrity and learning. As an example of the precautions taken as early as the middle of the thirteenth century for the prevention of the spread of disease and for the preservation of the "purity of the air" we find that there were specific ordinances in regard to the depth at which bodies should be buried and in regard to the disposition of refuse and the bodies of dead animals. Anyone who has had the misfortune to pass to leeward of a place where hemp was being macerated will not be surprised to find that the laws of Frederick II stipulated very precisely where and how this operation should be conducted. There was a fine for macerating hemp within the limits of a city or too close to a military camp. There were laws (apparently somewhat obsolete now in southern Italy) against throwing garbage into the streets or from windows, and there were strict regulations in regard to the keeping of hogs within city limits, particularly during the months of summer. Barbers and bleeders were forbidden to operate in the public squares and streets and were required to be very careful as to the manner in which they disposed of hair and blood. In the fourteenth century special statutes were drawn up in certain towns in regard to the slaughter and sale by butchers of infected or diseased animals, and these statutes apparently embodied regulations long in vogue.

In regard to the organization of the school at Salerno it would appear that there were four regents; the patron saint was Matthew; the seal bore the inscription "Civitas Hippocratica." The degree conferred was Magister. In time a distinction was made between magister and doctor, the latter designation being given to graduates whose attainments entitled them to teach, somewhat as we distinguish to-day between the common doctor and the professor in a medical school.

In the course of time it became customary to grant special licenses to men who restricted their practice to war wounds, to diseases of the eye or to rupture. Candidates for license had to furnish evidence that they were born in wedlock. Physicians were appointed to serve at court, and there were royal midwives. Physicians were appointed to serve with the troops. They were mounted officers, and their commissions stipulated whether they were to have one or two horses. There are records of claims submitted by these military surgeons to recover for horses which were sick or had died.

P. Giacosa, in his work "Magistri Salernitani nondum editi,"[1] says: "The references which we find scattered through the most ancient chronicles in regard to Salerno, do not speak of famous teachers but of physicians with a reputation for their cures. Medical literature, therefore, necessarily reflected this state of affairs and was essentially technical and practical." Again, referring to certain ancient authors, "* * * they mark the moment when the medical school of Salerno comes forward with publications in which previous material scattered and dispersed throughout various manuscripts is collected, assembled, and systematized for adaptation perhaps to medical instruction. The materials are still the old materials, but undergoing coordination and distribution, and in accord with logical concepts as to use. * * * We now see the masters of Salerno in a position to write for themselves. If we can not pronounce their work absolutely original [how many years must still elapse before anything absolutely original is written in medicine] it is certainly individual and characteristic. What we see in their books is no longer a mosaic of fragments derived from ancient authors, but an elaboration of their materials worked up and arranged in a new form."

We may thus summarize the positive results accomplished by Salerno. It was the first great center for systematic medical study and maintained through at least three centuries a definite and high standard of professional learning. It encouraged the study of medicine by women, disseminated a literature that embodied the highest professional achievements of the time, and recognized ability without regard to race, creed, or sex. Accurate observation of physical phenomena and common sense therapy was emphasized. Sanitation was developed. Careful compounding was enforced. All learning was held in honor. The conscientious, studious practitioner was sharply differentiated from the employer of claptrap remedies, the charlatan, the irresponsible, itinerant vender of nostrums. On the other hand the masters and doctors of Salerno were not too fine to roll up their sleeves and soil their hands in the interests of their patients. They opened abscesses, abstracted blood, made vaginal examinations with the aid of any resilient bit of metal that could be arched over and by its spring hold the labia apart to permit the introduction of guiding finger and instrument. They worked in association rather than singly, having an eye always to the honor of their school and confraternity and of those who had gone before, and they had that true business instinct which in the long run operates for the benefit of patient and physician alike.

[1] Bocca Bros., Turin, 1901.

In a word, Salerno was a pioneer in many fields of endeavor which have not been completely exploited in our own day. We see in the literary work of the four masters and in the practice of cooperation by professors of Salerno in attempting to elucidate a subject without regard to individual fame a foreshadowing of the "team work" which is fast becoming so valuable a feature of hospital work in medical centers like Philadelphia, Chicago, New York, and Boston.

The last ray of luster that fell upon Salerno as its fame declined and its following grew smaller and smaller was shed by the school of Paris, when, in 1749, torn by internal dissentions over the relative status of physicians and surgeons, the dean of the medical faculty wrote to this ancient guide in learning and conduct to obtain an opinion on this delicate and important matter. The reply of Salerno is not extant but we may legitimately assume that the verdict was in full accord with its glorious record of combined wisdom and practicality.[1]

[1] The contributor of this paper disclaims any pretense to original research, having merely translated or quoted passages from the Latin, Italian, French and English works referred to in the text, hoping to attract the attention of some of the readers of the BULLETIN to a subject of great interest.

EDITORIAL.

CONCERT PITCH.

To the real music lover, the confirmed opera goer, what is more appetizing, more delightfully prophetic of the pleasure about to be enjoyed, than the thrumming and scraping of violins, commonly called tuning up? It makes an appropriate accompaniment to the shuffling of feet, the swish of skirts, the rattle of seats being dropped into position by enterprising ushers as the belated portion of the audience with a certain air of harboring reproachful consciences hurries to the allotted places. There will be a pause when all the strings have been tightened and the instruments are in tune, a solemn, delicious moment of silence, followed by the rap of the conductor's baton, and then the pure bliss of perfect harmony.

The tuning up is an absolutely necessary preliminary to proper instrumentation, because instruments can not remain at concert pitch between performances. It is the same with the human machine. The heart strings must relax, the brain must rest. Sleep, diversion, change of scene, are necessary to efficient performance of work, and correspond to the lubricant, without which the most powerfully constructed mechanical converter of energy will go to ruin by attrition of its constituent parts. These are all trite and old sayings and would need no repetition if people, busy about many things, were not prone to forget the less obvious facts. In November the papers contained a startling account of how a civilian threw himself from a window, owing to a nervous breakdown, the result of strenuous voluntary labor for the Government, now embarrassed by multitudinous problems of many kinds. While far too many of our people are still asleep or enjoying the comfortable but unreal security of the proverbial ostrich, a respectable number of Government servants and their coadjutors are working at high pressure, and must inevitably go to pieces unless they can temper zeal with judgment, and appreciate that in this war the race is not to the swift. Had the overwhelming strategic defeat of the Marne been inflicted upon an enemy counting solely on the effect of a sudden coup and incapable of sustained effort, the war would not be in progress still. Sustained effort, and not violent self-damaging, short-lived effort, is what is desired in our partiots to-day. If we put a Derby winner, capable of a mile and a half of strong running, into a seven-furlong race, he will be beaten by any selling plater having a little burst of speed;

but the big race and the big prize are what we are entered for, and there a burst of speed will avail nothing. Just now there is urgent need, it is true, for us to produce men and arms as fast as possible, but they must be good men and good arms in great numbers, and we must not underestimate the distance we have to travel.

For years some of those who have watched the system of training in our fleet have felt that there was a disposition to use hot-house methods in a struggle for prompt, visible results, and the conviction has grown stronger and stronger that it is a grievous mistake for any ship to sacrifice the making of a body of all around man-of-war's men to the glory of winning the trophy in a single target practice. Everyone admits that too often haste makes waste, but it is not for the ambitious young gunnery officer to be held back by such considerations. These are rather for the larger view, the larger powers, and the larger responsibility of those who have the direction of the aims and methods of the naval service.

With this long introduction, we come to the single point in mind. A rather limited number of naval vessels are employed in the hazardous and highly important work of convoying transports. It is arduous duty, requiring that all the faculties of every man on board be at high tension for at least five days on each voyage. If the balance of the voyage, the portion outside the danger zone, could be passed in peace and quiet, at rest, with diversity of scene and occupation, both mental and physical, such an interval would largely supply the opportunity for the necessary relaxation between performances; but such is not the case.

Those who know ship life know that there is no real relaxation at sea, either for the stoker or the lookout, the captain, or the young watch and division officer. Even if all threat of torpedoes and mines could be eliminated, any available time must be given to instruction and drill, more necessary now than ever, with crews composed largely of willing and eager but comparatively inexperienced men. And finally there is the endless labor of upkeep, the fight by ceaseless chipping, scaling, red-leading, and painting against all the factors operating to disintegrate the ship itself. No landlubber has any conception of what huge proportions this task assumes, and officers on long periods of shore duty are likely to forget it like many other things that become hazy to those who occupy the seats of the mighty. In port there is repairing and loading and unloading to be done, and all too quickly the ship is off for another run. It is a fascinating game, but it has its drawbacks. Unless after three or four consecutive trips a given ship can skip a voyage and its complement enjoy the restorative effect of a fortnight ashore, deterioration of service through impairment of the human machine is inevitable, and disaster will be inevitable too. Men grow used to anything in time, and

men also become so jaded as to be indifferent to the most startling menace. A jaded lookout! "Impossible," you exclaim, "when the submarine is lurking near by." Well, familiarity still breeds contempt, and monotony still continues to be the deadly foe of energy and initiative.[1]

The American is a special type, and that particular and undefinable composite creature, the American sailor, is a special subdivision of the species. After two or three runs he is apt to assume toward certain dangers a mental attitude expressed somewhat as follows: "If they are going to get us, they'll get us," and having survived several round trips he begins to consider creature comforts. *The crews of convoys and patrols should be neither physically jaded nor clothed with mental apathy.*[2] Medical officers must bear this in mind and do what they can, by judicious representations to proper authority, to maintain the hygienic balance of the psychic as well as of the physical elements in the men of the service, since the equilibrium of the former depends on the latter.

We have been invited by our allies in a candid and generous manner to profit by the mistakes they committed in the earlier periods of the war, and we would certainly be foolishly blind not to profit as well by instances of their sound judgment and wide range of vision. Unfortunately it is often difficult to determine the exact importance to be ascribed to a given factor in the conduct of affairs not yet concluded, whose success has not been signaled by a definite, manifest, conclusive victory. We believe that it is from motives of shrewd policy, with the purpose of developing the maximum output of the best effort in the moment of acute need, and not from any sentimental regard for feelings or for individual happiness (save as reasonable contentment makes for efficiency), that the British Admiralty, through all the long period of vigilant guard maintained in the Channel and North Sea, has consistently sent groups of men on leave and periodically relieved ships from guard in the zone of active duty.

We are engaged in an attempt to bring the personnel of our battleships to the highest possible state of efficiency. To this end, drills are long and frequent, and many features of war conditions

[1] Speaking of the value of a careful lookout as a protection against the submarine, the First Lord of the Admiralty, Sir Eric Geddes, said that if a submarine is sighted by the lookout on a vessel—whether the vessel is armed or not makes no difference—it is seven to three on the ship in favor of its getting away. Out of every ten attacks, when the submarine is sighted by the ship, seven of them fail; but of every ten attacks when the submarine is not sighted eight ships go down.—Scientific American, Dec. 20, 1917.

[2] Medical Inspector C. N. Fiske, United States Navy, in a footnote to his article in the last BULLETIN, says: "The tension noted formerly in danger zones has become relaxed to such a degree that resort to alarms has been suggested to keep the men alert."

are being introduced, perhaps somewhat artificially, into the fleet. In the struggle for efficiency two things must be continually borne in mind: First, men enlisted for a term of years have less at stake than officers who have entered the Navy for life, and they possess infinitely fewer resources within themselves to enable them to endure long periods of monotonous isolation; second, drills and imaginary war conditions, if imposed and prolonged ad nauseam, produce general fag and staleness. Nausea is not a state from which men leap strong into action. Zest and freshness are the spring that sets the most valuable activities in motion. Let us not break the spring, nor, by long-continued ill-timed pressure, destroy its resiliency.

THE OIL IMMERSION VERSUS THE LOW-POWER OBJECTIVE.

Dr. Meigs, of Philadelphia, famous in his day throughout the country for his success in curing the sick, used to say that if a physician had to be restricted to either general or local treatment he should unhesitatingly choose the former. It may also be accepted as true that in most cases a general survey of all the symptoms and attendant circumstances of the sick man will give a clearer picture of his condition than the minute and exhaustive study of any single factor in the case. The ideal examination, of course, comprehends anamnesis, study of symptoms, physical diagnosis, and the application of the precise methods of the modern laboratory to every element of the materies morbi. Such a thorough exploration is not always possible, however, and there is a tendency to-day, especially on the part of our younger brethren, to lean unduly on extrinsic aids to diagnosis.

Any disposition to discredit the value of the reports of pathologists, bacteriologists, or other specialists would stamp a man as a fool, but a warning suggestion is not out of place. The naval surgeon is frequently beyond the reach of expert assistance. A laboratory is not always within call, and there are no coat-tail pockets in his working uniform to accommodate stethoscope, sphygmomanometer, and other mechanical aids. Situations constantly arise where the medical officer is confronted with a patient and must make a diagnosis without microscope, books, or specialists to assist him. He has available for the task his medical knowledge, his five senses, and, it is to be hoped, that sixth sense which functions without visible organ.

The common idea of the laity is that, given a certain set of symptoms, a diagnosis follows as a matter of course. On board ship many of our patients regard the diagnosis and treatment of disease as analogous to the work of a signal quartermaster. When the man

on the bridge is told to signal to another ship he has only to whip over the pages of the signal book and secure from the index the conventional letter, word, or number required for each unit of the message. When a signal is to be deciphered the reverse process is to be employed. At the mention of a pain in the back, a numbness in the toe, a headache, there should, according to the popular notion, flash into the doctor's mind, supposed to correspond to the index of the signal book, a prescription appropriate to the symptom named.

"Doc, have you anything good for a headache?" is a question that the general practitioner probably hears on an average of once or twice a week throughout his professional life, because the public does not realize that the doctor's mind is not an automatic device like an adding machine. The doctor is essentially a judge, and the symptoms and signs of disease are the witnesses. Many of them are humdrum, uninteresting, witnesses whose answers can be anticipated—self-important, voluble witnesses who like to be summoned in every case and enjoy making themselves conspicuous. How constantly headache, fever, constipation, coated tongue, malaise, and anorrhexia file past the tribunal. Other witnesses, e. g., the solitary crepitant râle, the occasional cast, the faint chemical trace of albumin, the unilateral change whose significance is purely relative, the barely perceptible alteration of temper or disposition are elusive, sly, uncommunicative, eager to slink by unobserved and have their whispered responses drowned in the noise of trivial reports. In the total volume of evidence much is negligible, some has a corroborative value, and but a small portion may point to the offending member and tilt the scales which the discriminating judge balances so carefully. The good physician is the good diagnostician, and the good diagnostician is he who best knows how to discard the mass of irrelevant matter and quickly seize the telltale detail. The faculty to do so is derived in the main from a close study and comparison of countless clinical cases.

Considering our predecessors in this way, we must recognize them as our superiors in diagnosis. They could interpret the odor of the typhoid fever patient, the facies of cardiac and peritonitis cases, the peculiar aspect of the victim of tonsillar abscess. They could feel the alterations in the pulse wave of a typhoid patient. The pulse of aortic regurgitation made a stethoscope unnecessary. The physician of to-day usually recognizes little in the pulse save its rate and volume, and is lost without those accurate mechanical devices whose multiplication tends to hinder the development of diagnostic acumen and the acquisition of the priceless ability to weigh each fact and assign to it its exact value.

Habitual users of the high-power objective are numerous among specialists, and how the general practitioner writhes in exasperation

over some of their verdicts! Fifteen years ago a midshipman came to the Bureau of Medicine and Surgery to have an aural defect waived preliminary to graduation. He was armed with a statement from an able and honorable ear specialist that there was nothing in the disability to debar the bearer from years of useful service. A medical officer, concerned in the decision, called on this specialist, whom he happened to know personally, and asked him, with justifiable indignation, to explain his affidavit. The specialist stood by his guns, maintaining that if the patient would call at his office from time to time for a little special treatment his ear would be good for years to come.

"And how will he call when serving in Haiti, on the upper Yangste, or in the Celebes?" asked the Navy doctor, substituting a two-thirds for a one-eighth inch objective.

An officer with a bad heart, variously diagnosed as myocardial degeneration, auricular fibrillation, etc., whose symptoms and signs were dyspnœa on exertion, attacks of vertigo, a soft, irregular, nearly imperceptible radial pulse, an inaudible, impalpable apex beat, a diastolic pressure of 90, a systolic pressure of 100 to 105, who was retired from active duty, had no trouble in getting bona fide specialists to assure him that he was perfectly fit for duty as executive officer, *provided he did not overexert himself or undergo any mental strain, but led a quiet, care-free life*, which was comparable to telling the foreman of some industrial plant to go to work, but to wear an eye shade, sit in a rocking-chair, and talk in a whisper.

It is more startling still to behold a civilian urologist taking up the cudgels in defense of victims of venereal disease and certifying to an innocent origin, because with the lapse of time and with changes in the moral and social status of the patient it often becomes so highly desirable to establish a nonvenereal origin. The absence of a scar on the penis is accepted as ample evidence of nonsexual infection in the private patient, as though extragenital sores were unheard of. That a man should pass through the hands of a dozen medical officers, receiving treatment for 3 or 4 years, eventually be discharged from the service for some gross lesion of the nervous system, and yet wait 10 years before claiming to have contracted the disease in any but the old-fashioned way, would certainly strike 12 ordinary jurymen as highly improbable, even if they had surveyed the corpus delicti through a magnifying glass and found nothing. Nevertheless such cases, such histories are constantly presented to the Bureau for adjudication.

These are exaggerated cases and serve as a reductio ad absurdum of the one-sided views of certain professional men. They show how far some specialists can go in defending what they regard as the patient's interests (sic) against unbending Government requirements. There

are many instances of less conspicuous disability in which room for doubt exists, though there is a preponderance of probability that, under service conditions, the disability will either become serious or assume such importance in the mind of the sufferer as to preclude his doing useful work for the Government and be made the excuse for leaving the service before he has given a quid pro quo for the expense involved in his training. These service conditions are outside the field observed by the specialist with the high power objective, which is natural enough, but there is no excuse for his failure to attempt to estimate the force of these considerations, for his calm neglect of that side of the case.

Eminent in the domain of physiology, a man urges butter for an emergency ration, because butter is such an admirable form in which to supply some of the needed fat in the normal diet of human beings under normal conditions of living. A butter ration stored for three years, prior to use, in a paymaster's storeroom, located perhaps no great distance from the ship's boilers, might not be any better than a digestible oil; if kept under different conditions it might, on the day of shipwreck, approximate to tallow. Examples might be multiplied of the excellence, from a technical point of view, of the advice constantly proffered and the methods suggested, which are impossible of application to the abnormal life of that abnormal creature—the sailor. (A learned Englishman once reproved a young lady for speaking of a "common sailor," and informed her that there was no such thing as a common sailor, for any and every sailor was a most uncommon and extraordinary animal!)

The ophthalmologists crave an opportunity to instruct the sailor about the care of his eyes; students of sociology would like to form an antivenery organization; the psychiatrist urges the claims for exemption of the feeble-minded; the anthropologist wants to measure the boys, and so on ad infinitum.

Because widespread epidemics play havoc with the numerical strength of fighting forces, we are busy now detecting meningitis carriers and perfecting methods of detention and isolation for recruits, with antityphoid treatment and vaccination against smallpox sandwiched in between cultures, swabbing, and disinfections. It is not an easy matter to get the recruit safely through these various steps in three weeks, and long before the expiration of this period the line officer is clamoring to have his pupil begin the long and laborious training necessary to make him handy with a rifle, able to pull an oar, familiar with the drill manual, acquainted with the rudiments of wigwagging, and a host of other things that must be learned before he is fit to embark and begin his novitiate at sea. Medical work of this character has immediate practical value.

For the present, however, there must be a limit to those many and varied scientific investigations, of less imperative necessity for which the enlisted man affords such a convenient, docile, and inexpensive subject. It would be interesting to give bismuth meals to 20,000 lads to determine the percentage of ulcers in stomachs and bowels of seemingly healthy males. It would be interesting to test them in the laboratory for varying degrees of idiosyncrasy to vegetable and animal protein. Electro-cardiographic tracings and X-ray examinations of chests would yield valuable data and make interesting footnotes and statistical tables for one more highly scientific book. Eyes and ears could be investigated with profit and there are kidneys—two to a man—and hands and feet, and the recruit's intellectual faculties might bear scrutiny. But just now our country happens to be at war and the country's situation should be surveyed under such magnification as will furnish the largest possible field of view and the maximum of definition.

In attempting to select our material for the prosecution of the war, there is danger of becoming hypercritical and overfastidious. There will inevitably be large loss of life in the field at the hands of the enemy. Inevitably, too, some lives will be sacrificed outside of the danger zone, because of weaknesses not discovered during the training period, but the campaign must be prosecuted as the paramount thing, and the tabulation of interesting medical facts and the conduct of scientific investigations must for the moment wait on the settlement of those larger issues which are threatening to-day the life of peoples and races. Just now the ability to handle Navy beans had better be determined by the practical test of the mess table, and the vicissitudes of life on destroyers and submarines in the British Channel and the German Ocean will amply demonstrate to what extent our men have the *stomach* for a fight.

SUGGESTED DEVICES.

A SUBSTITUTE FOR THE SAILOR'S HAMMOCK.

By C. P. KINDLEBERGER, Medical Director, United States Navy.

Practically all experienced medical officers, I think, are a unit in concluding that the present hammock for enlisted men is a relic of the past; that it has been retained for want of a suitable substitute, and should be replaced, if practicable, by some other form of sanitary, comfortable cot or bunk.

The ideal sleeping accommodations on board ship would be folding or stationary, single or double-banked bunks, with spring bottoms, similar to those installed on the latest type of destroyers, in sick bays, chief petty officers' quarters, and on board transports. This, however, is impracticable at present, owing to the large crews of modern men-of-war and the lack of sufficient space.

I firmly believe that a certain number of men can not sleep comfortably in the Navy hammock on account of the exaggerated curve, which causes morning stiffness of the back, due to overstretching of the lumbar muscles and ligaments for a number of hours. These men and others, who for various reasons do not like to swing in their regular billets, will be found sleeping on deck, on top of chests, and in out-of-the-way corners of the ship—a most insanitary and unsatisfactory way of sleeping. Others attempt to flatten their hammocks and reduce the curve by using spreaders.

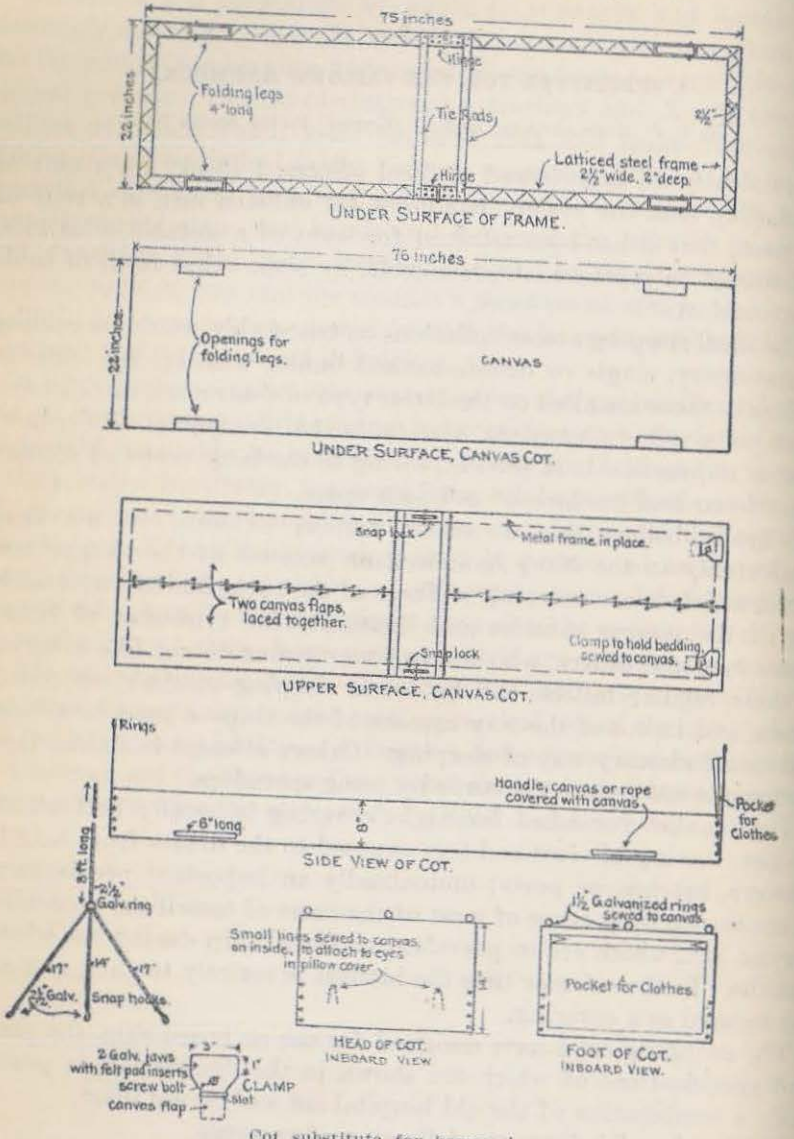
The blanket furnished for night covering is usually half off the sleeper, leaving his feet and legs exposed to the drafts from near-by blowers, hatches, or ports; undoubtedly an important predisposing if not the exciting cause of most of the cases of tonsillitis, bronchitis, coryza, etc., which are so prevalent on board ship during the winter months. In the summer time the blanket is entirely too hot, and can not be used as a covering.

The swinging cot I have designed for use on board ship, the plans and specifications of which are shown in the illustration, is practically a combination of the old hospital cot and Army litter.

This cot has, I believe, the following advantages:

(*a*) It furnishes a comfortable, flat, swinging bed, which should move gently with the motion of the ship and remain practically level at all times, thereby reducing the incidence of seasickness among susceptible members of the crew.

(*b*) These cots can be swung on two or three levels, if necessary, giving better air space per man and allowing a more orderly arrangement than is possible at the present time; also permitting a gangway to be left open fore and aft on each of the sleeping decks.



Cot substitute for hammock.

(*c*) The pillow is just thick enough to elevate the head slightly above the general level of the body, and the sheet is an addition, both for use in cold weather and in the summer time, when a light covering is necessary, to protect those sleeping on the open decks from the chill and dampness of the sea air.

(*d*) The clamps designed for the foot of the cot will hold the bedding in place at all times and prevent chilling of the feet and body.

(*e*) The pocket for clothes, located on the inner side of the foot of the cot, should lead to the readoption of pajamas or some suitable form of night clothing for the enlisted men, thereby doing away with the present insanitary and objectionable practice of sleeping in the underclothes.

(*f*) The canvas part of the cot can be quickly removed from the frame for scrubbing. The suspension ropes, with their snap hooks, are easily detached from the six rings sewed to the canvas ends. The hinged metal frame will allow the cot to be hung over the rail or awning ridge rope, and permit adequate airing and sunning of the bedding.

(*g*) The canvas sides of the cot will keep the mattress and bedding in place, and protect the sleeper from drafts, and the fastenings on the pillow cover will keep the pillow in place.

(*h*) When folded and lashed these cots will stow neatly in a row, like a shelf full of books. It is realized, however, that these cots will require more stowage space than the present hammocks.

(*i*) When the 4-inch folding feet are opened, one can sleep on the open decks with comfort, and be assured that the bottom of the cot and bedding will remain dry unless a heavy sea is shipped.

(*j*) When the feet of the cot are folded, four bearers can carry a sick or injured man to the sick bay by means of the rope handles on the sides. If the sick bay is on another deck, the patient can be lashed in and slid up or down the nearest gangway ladder. By means of a sling hooked in the handles, a patient can be lashed in this cot and lowered over the side to a waiting boat for transportation to a hospital ship or a hospital on shore.

(*k*) The metal frames for these cots should be part of the equipment of each ship or station. Upon transferring a man from one ship or station to another the pillow, mattress, and bedding could be rolled in the canvas portion of the cot and lashed to the clothes bag.

AUTOMATIC DRINKING CUP STERILIZER.

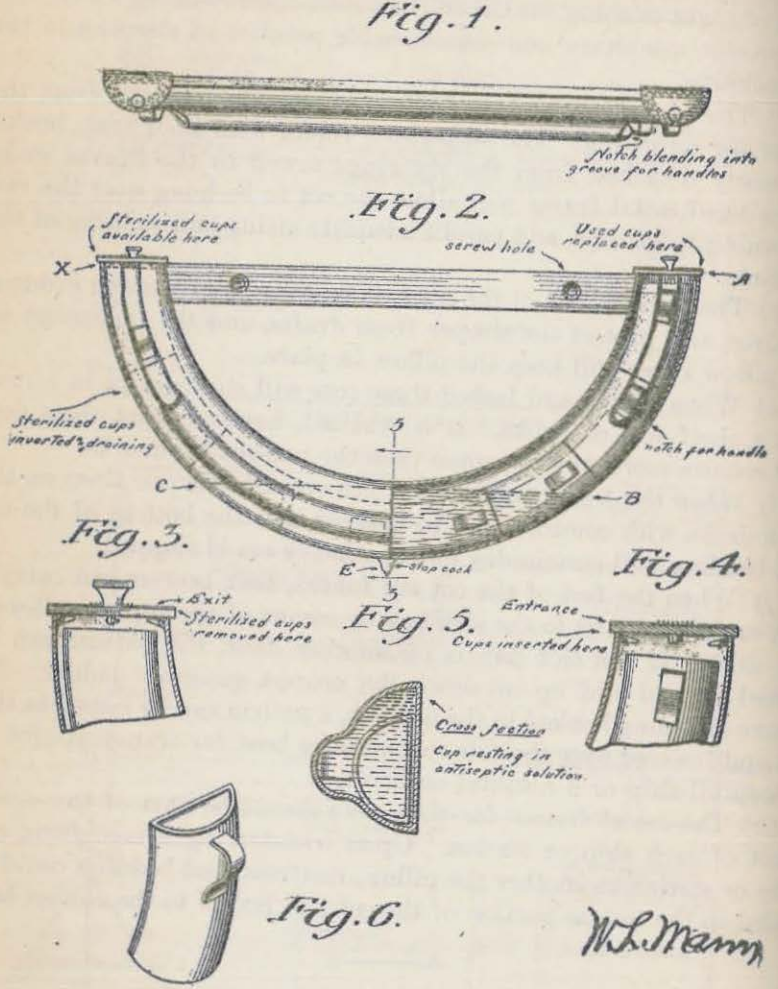
By W. L. MANN, Passed Assistant Surgeon, United States Navy.

This consists of a semicircular tube containing a chain of cups. A cup enters upright, is pushed through the solution and emerges in an inverted position. The entrance *A* has a one-way catch, which permits insertion but not extraction of a used cup.

The shape of the cup in relation to the tube permits insertion of the cup in only an upright position, rendering it fool-proof.

Each time a used cup is inserted it causes a sterilized cup to become available at exit end, a one-way catch permitting extraction and preventing insertion.

The cup enters upright, goes through the antiseptic solution and emerges in an inverted position to permit drainage.



Automatic Drinking Cup Sterilizer

A–B, entering section; *B–C*, sterilizing section; *C–X*, draining section; *E* is a stopcock to drain off the antiseptic fluid previous to renewal.

Solution used: Tabloid of chlorinated lime dissolved in a cup of water.

A working model made some time ago gives fair indication of success but the type of metal to be used for the sterilizer and the best antiseptic solution is still *sub judice*, corrosion having to be considered.

A FORM FOR DAILY SANITARY REPORTS.

By R. W. PLUMMER, Medical Inspector, United States Navy.

MEDICAL DEPARTMENT,
UNITED STATES MARINE BARRACKS,
Navy Yard, Philadelphia, Pa., _____, *191*_.

From: Post surgeon.
To: Commanding officer.
Subject: Sanitary report.

BARRACKS No. 1.

Ventilating_____ Heating_____ Lighting_____
Second floor, Back room, north____No. of men_____ Cubic feet_____
Back room, south____No. of men_____ Cubic feet_____
North dormitory____No. of men_____ Cubic feet_____
South dormitory____No. of men_____ Cubic feet_____
Fourth floor room_____No. of men_____ Cubic feet_____
Brig_____ Lavatories_____ Baths_____
Remarks_____

BARRACKS No. 2.

Mess hall_____ Gallery_____ Butcher shop_____ Cold storage_____
Disposal of garbage_____
Second floor, North central room__No. of men_____ Cubic feet_____
South central room__No. of men_____ Cubic feet_____
South end room____No. of men_____ Cubic feet_____
North end room____No. of men_____ Cubic feet_____
Third floor, North central room____No. of men_____ Cubic feet_____
South central room____No. of men_____ Cubic feet_____
North end room_____No. of men_____ Cubic feet_____
South end room_____No. of men_____ Cubic feet_____
Lavatories_____ Baths_____ Flushing_____
Lighting_____ Heating_____ Ventilation_____
Remarks_____

BARRACKS No. 3.

Mess hall_____ Galley_____ Bakeshop_____ Coal storage_____
Disposal of garbage_____
First floor, West end room_____No. of men_____ Cubic feet_____
Second floor, West end room_____No. of men_____ Cubic feet_____
West central room___No. of men_____ Cubic feet_____
East central room___No. of men_____ Cubic feet_____
Third floor, East central room____No. of men_____ Cubic feet_____
West central room___No. of men_____ Cubic feet_____
West end room_____No. of men_____ Cubic feet_____
Fourth floor room_____No. of men_____ Cubic feet_____
Heating_____ Lighting_____ Ventilation_____
Lavatories_____ Flushing_____ Baths_____
Remarks_____

POST EXCHANGE.

General condition_____

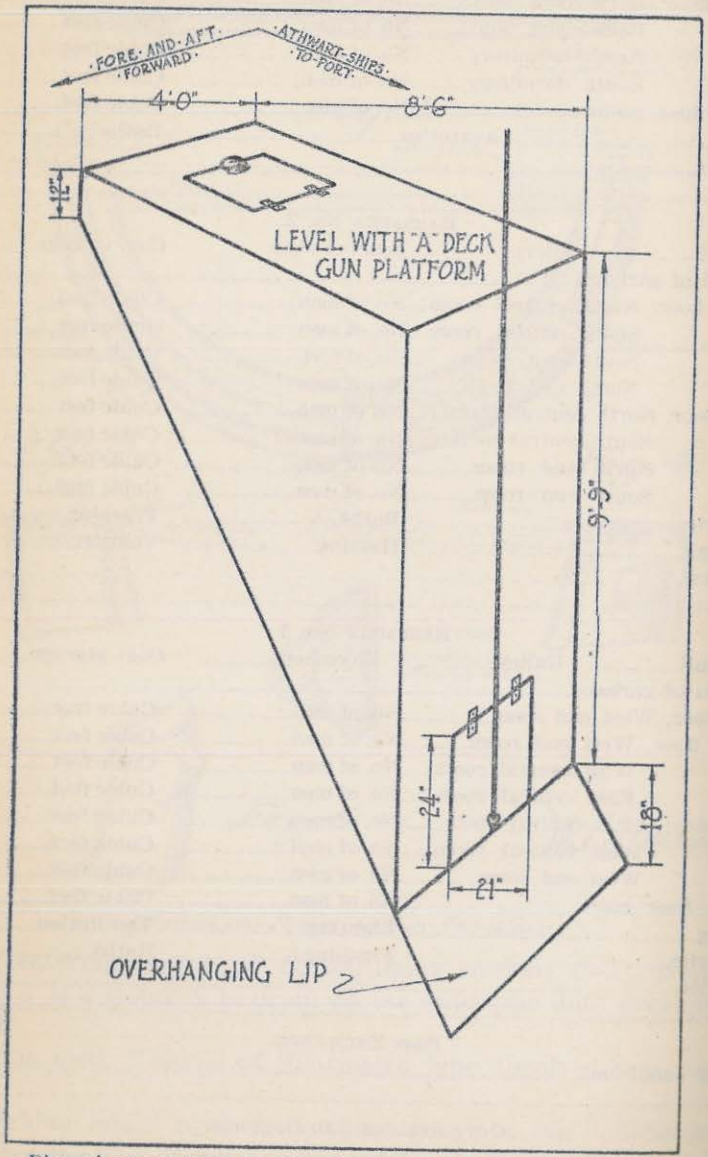
OUTBUILDINGS AND GROUNDS.

MEDICAL DEPARTMENT.

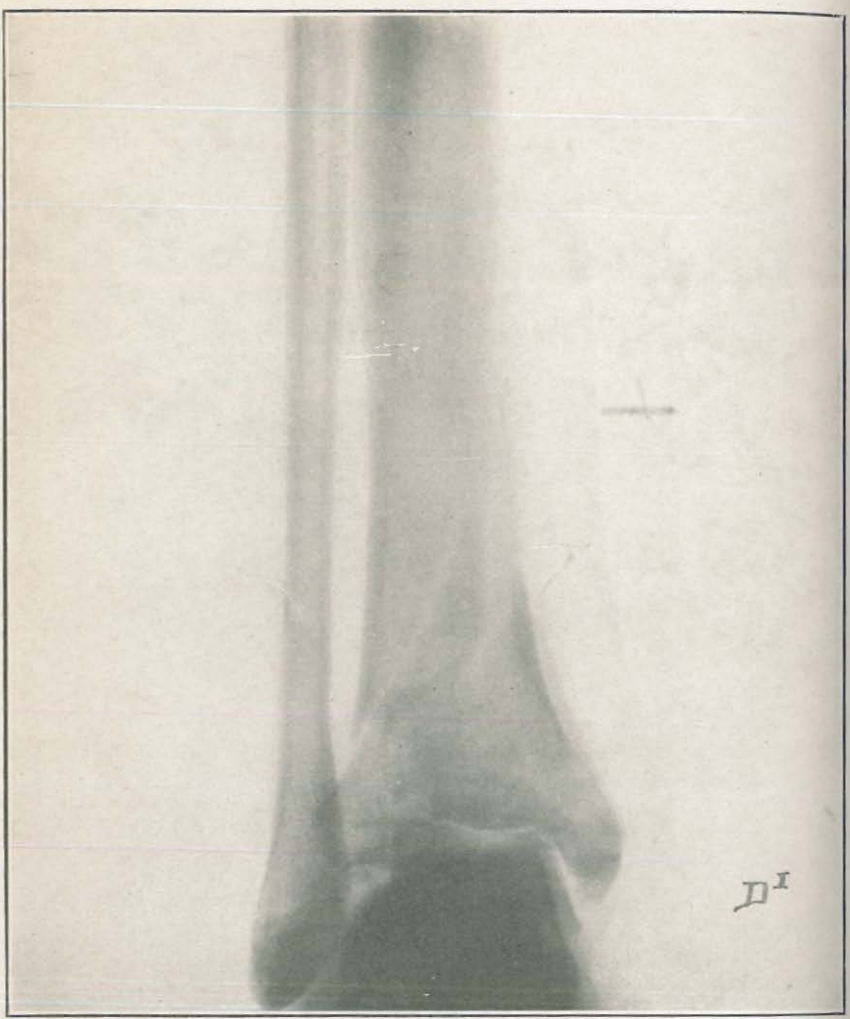
Total number of men on sick list, all causes_____ _____
Total number of contagious diseases_____ _____
Total number of venereal diseases on sick list_____ _____
Total number of venereal diseases under treatment_____ _____

_____,
United States Navy.

A GARBAGE BIN FOR USE ON NAVAL TRANSPORTS.



Dimensions and type of garbage bin proposed for naval transports.



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Right leg.

CLINICAL NOTES.

THE HANDLING OF A FRACTURE CASE AT SEA.

By C. C. KRESS, Passed Assistant Surgeon, United States Navy.

At 4 p. m., September 10, 1917, when three days out on a cruise, Ensign A. I. M., United States Navy, fell from the maintop to the superstructure deck, 30 feet below, striking the clear deck upon his feet, bolt upright. Both legs were fractured a little above the ankles, but there was no shock or unconsciousness at the time. The left leg showed little deformity, but the right was flexed backward at the site of the fracture of the two bones, giving a flail joint.

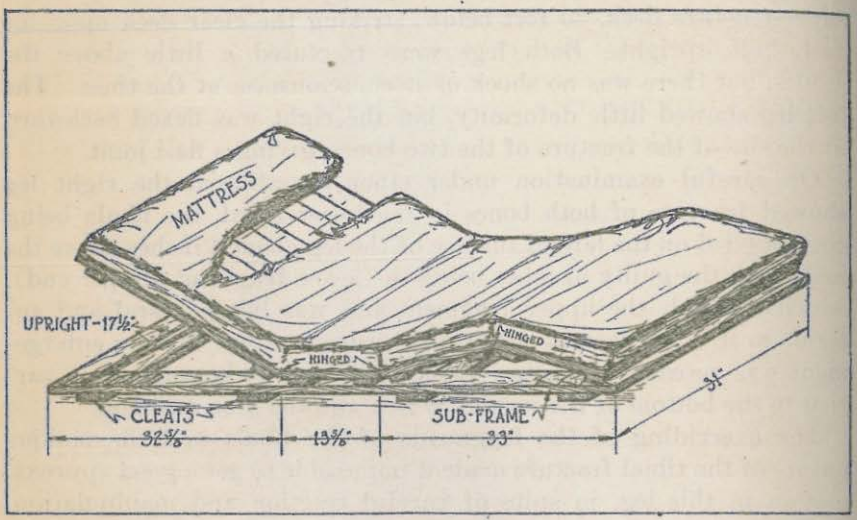
On careful examination under ether anaesthesia, the right leg showed fracture of both bones in the lower third, the fibula being compounded on the lateral surface of the leg about 4 inches above the malleolus, the guilty member being the lower fragment (upper end), which overrode the upper fragment and was lying lateral and anterior to it. The wound thus caused was so patent that no enlargement was necessary. Iodine was applied and a cigarette drain carried to the bottom of the wound, which allowed free drainage.

The overriding of the fragments of the fibula and the oblique nature of the tibial fracture made it impossible to get a good approximation in this leg, in spite of careful traction and manipulation. In the left leg, however, reduction to good alignment was easy; probably the fibula had remained intact. The tibia was fractured in the lower third. The tumefraction about the ankles and the increased width of the ankles indicated considerable damage—perhaps rupture of the tibio-fibular ligaments—or involvement of the joint through extension of the fracture of the tibia, usually spiral.

The limbs were placed in fracture boxes suspended by gallows above the level of the fracture bed, giving slight extension, care being taken to have the feet at right angles to the leg, and avoiding rotation of the leg—the most useful position in case of bad result. The fracture bed had been constructed on board at my direction for a case of peritonitis and used to obtain the Fowler position. It was built to fit over a sick-bay bunk frame, and had an adjustable head and foot piece. When covered with a mattress it made a most indispensable apparatus, equally good in peritonitis, large fracture cases, and extensive burns. A sketch of the construction is shown.

The patient had no shock, but vomited a little. At 8 p. m. tetanus antitoxin, 1,500 units, was administered. Temperature, 100.2 F.; pulse, 90; respiration, 18. Catheterization was required soon after midnight, and 500 c. c. normal urine, specific gravity 1,030, were drawn off.

At 9 p. m. September 11, 1917, it became necessary to remove the extension, as the ankles had become so ecchymosed, swollen, and edematous with formation of vesicles that the pressure necessary to secure any extension could no longer be endured. The drain in the compound wound was renewed and the wound re-dressed. Temperature, 101.5 F.; pulse, 104; respiration, 24. Evidence of slight shock



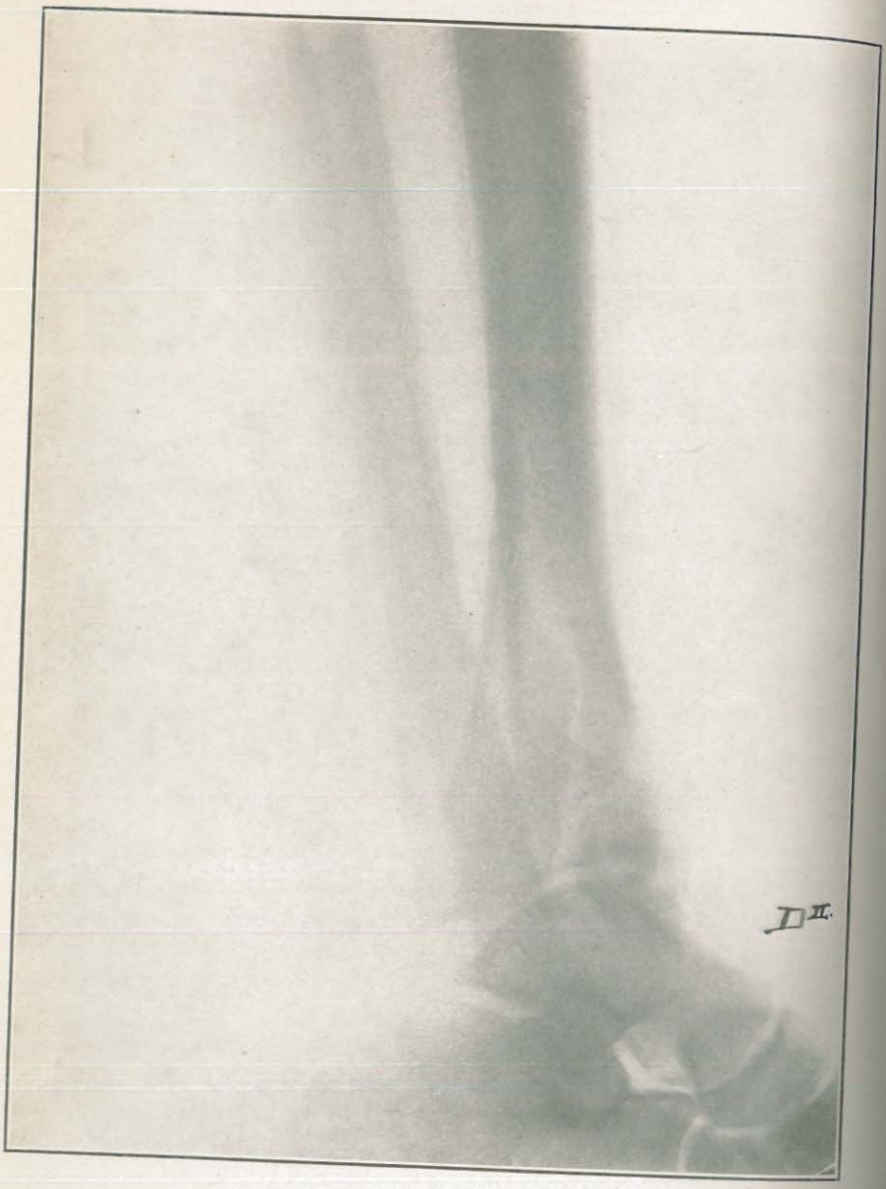
Fracture bed.

and some reaction to the antitoxin. On September 12 the urine, which had been scanty and of high specific gravity, was suppressed. This is a symptom of a delayed internal injury. It was relieved by hot packs. No evidence of wound infection. No extension was employed now, except that obtained by the pull of the body's weight on the leg, elevated on the fracture bed, and fixed in the fracture box, which was anchored to the bed.

On September 13 the temperature became normal at noon, but at 9 p. m. rose to 101.4, pulse 95, respiration 21. There was no infection of the wound nor need for further drainage. A new difficulty now appeared—a problem new in our service and one which will complicate all our methods of handling severely injured men, namely, the preparation for a possible hasty evacuation at "abandon ship." The ship was approaching the danger zone, and it became necessary to take the patient up from the sick bay to the berth deck and have him ready for quick evacuation from the admiral's cabin on the gun

258–1

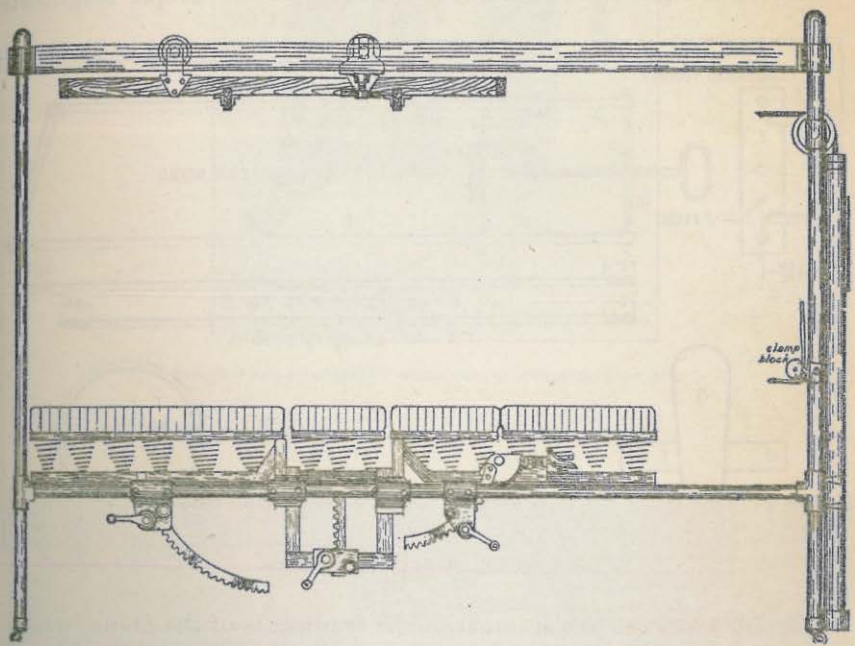
Left leg: Fracture of both bones.



258-2 Lateral view of left leg.

deck. The fracture bed, mentioned previously, was made into a four-poster bed by the addition of four legs and a suspension apparatus rigged from ring bolts secured to the eyebeams above the bed. A set of two views of this apparatus (Figs. 1 and 2) shows the fracture bed clearly, and the three main lines of suspension running from the chest below the arms, the central portion of the body, and the legs.

By a system of blocks and ballast bags to neutralize the weight of the body, one nurse could lift the patient like raising a window, and have him in a Stokes stretcher in a moment, ready for "abandon ship" or for any extensive handling, cleaning, or dressing without

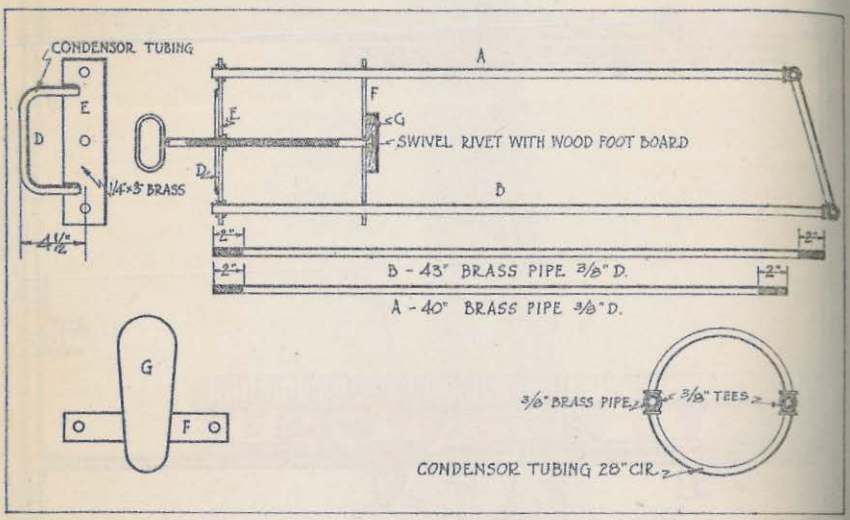


Fracture bed: Side view.

pain or disturbance to the fractures. By means of this apparatus extension as well as suspension was available for the legs. Figure 1 shows the legs put up in Thomas splints constructed aboard ship. Suspension was secured to these splints at the foot ends and at the front of the hip ring, extension being maintained by the splints, which also gave counterextension. These splints were not applied until the ankles had improved sufficiently to warrant receiving the pressure required for securing extension—two weeks after the accident (September 24).

A myocarditis developed on September 14, together with a severe bowel disturbance. The latter was soon under control; the former condition lasted until the 17th. There was a rise in the temperature every evening, the inguinal glands becoming slightly enlarged, but

the patient complained of practically no pain in the legs after the effects of the contusion began to disappear and had little pain, though very rough weather added much to his discomfort and to the difficulties of treatment during the last 10 days of his stay on board. On September 30, after 20 days' treatment aboard, he was transferred to the naval hospital in Washington. Examination of the injury just before his transfer showed the ankles still swollen but the skin all healed; all wounds and vesicles had healed; very slight induration at the site of the fractures despite the lack of extension and the other difficulties of the treatment. The left leg was in very good alignment. The right showed slight shortening due to oblique fragments

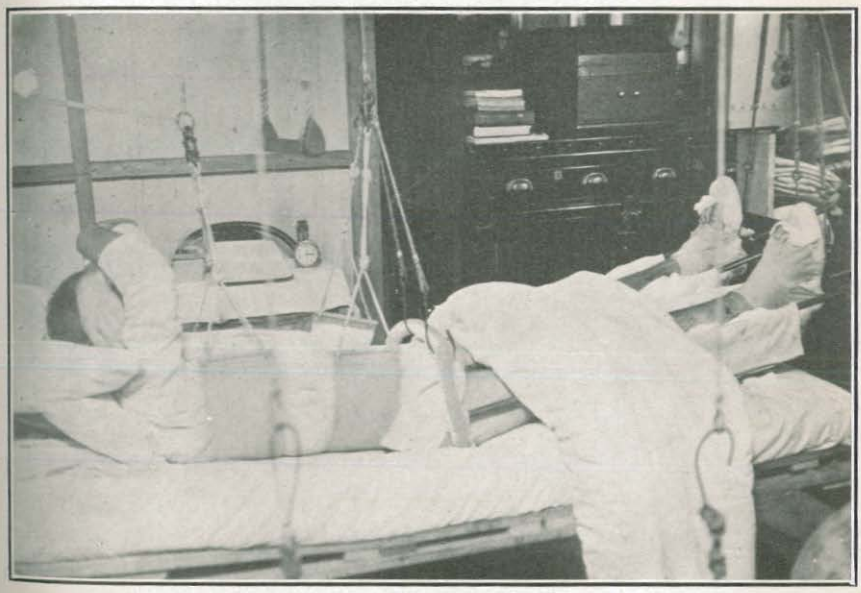


Extension device, drawn to scale.

of the tibia and to displacement of the fragments of the fibula, which made it impossible to set the fractures properly. There was ground for believing that the fractures would give a good result, but that there would be some stiffness of the left ankle, and that the right would be almost functionless.

Prints from the roentgenograms made at the United States Naval Hospital, Washington, D. C., taken eight weeks after the accident, show the spiral fractures extending into the ankle joints with the wedging apart of the fragments at the lower extremity of the tibia. The line of the joint in the right leg shows the extent of the damage to the ankle joint. The left fibula is not fractured. The left ankle shows a fairly clear line as though the function would be good. The report from the hospital on this case on November 7 states that the splints have been removed since October 22, the patient being up in wheel chair, and taking automobile rides. The patient states that

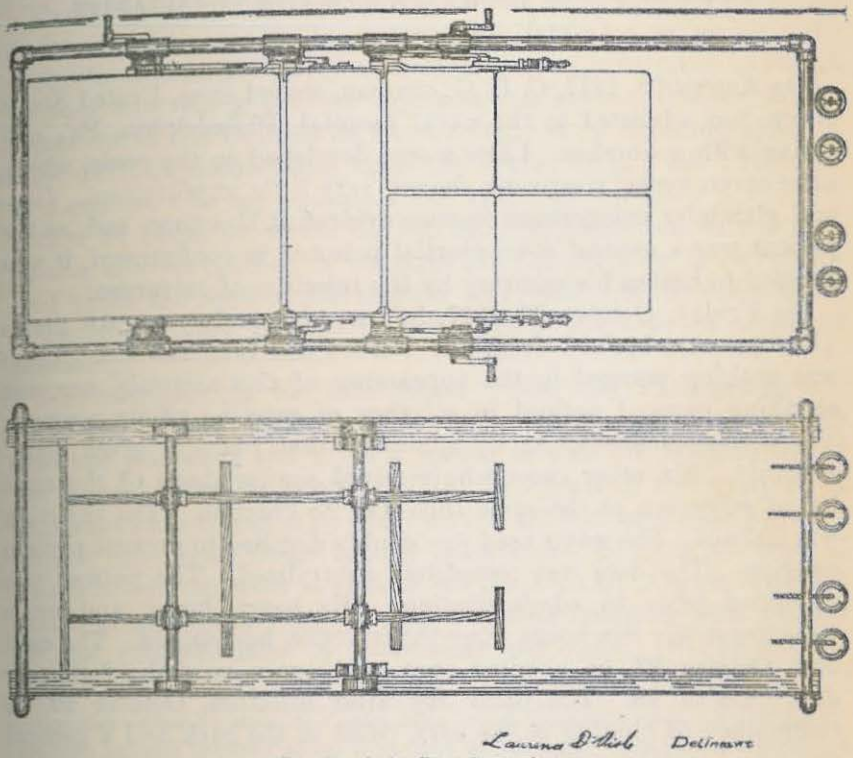
Fracture bed arranged for extension, counterextension, etc.



Fracture bed, showing supports to trunk.

there is no pain in the legs and that he can move both ankles fairly well, and notices improvement daily.

Taking care of this case, under the conditions noted above, has originated the suspension apparatus whose design is here shown. The material is obtainable aboard ship, and the device can be constructed by a ship's mechanics. It can be taken down and stored in the medical storeroom. The rollers are eliminated for ship construction and the apparatus is screwed to the deck instead. The overhead trolley is



Fracture bed: Seen from above.

suspended from live axles which operate through wheels running on the side frame of the top of the apparatus, and can be set at any point by means of a set screw and block working on the axle at the foot end. The trolley can be manipulated not only up and down but also across the bed, there being 6 inches free way to each side of the trolley. There are four lines for suspension with their separate sets of weights inclosed and running in oiled tubes thus allowing for any form of suspension and extension when a slight addition is made to allow for Buck's extension, which is easily applied.

This apparatus combines the properties of the fracture bed with the idea incorporated in the Dodds-Parker suspension. A bedpan

can be used without lifting the patient. Either leg, or both, can be raised or lowered, a ratchet and cog allowing the leg to be lowered at the knee, so that the sitting-up position may be obtained, or a Fowler's position, or an inclined plane for the knee. The advantages of a standard apparatus of this sort, manufactured in numbers for the hospitals in Europe, can readily be appreciated.

A CASE OF DEATH FOLLOWING INJECTION OF SALVARSAN.

By R. A. BACHMANN, Medical Inspector, United States Navy.

On August 28, 1917, C. B. G., seaman, second class, United States Navy, was admitted to the naval hospital, Philadelphia, Pa., suffering with gonorrhea. Later a sore developed on the penis, which, after seven weeks' treatment, showed very little improvement. General glandular enlargement became evident at this time, and, as the patient was a general court-martial prisoner in confinement, it was decided to hasten his recovery by the injection of salvarsan.

On Friday, October 26, 1917, he was given salvarsan, 0.6 grams (European), obtained from the Farbewerke-Hoeschst Co. There was nothing unusual in the appearance of this ampoule, nor was anything unusual noticed in solvency or reaction of its contents. There was no mishap in its administration. It was given intravenously. Six other cases who received similar doses of the same lot of salvarsan at the same time had no reaction. The injection was 200 mil. The water used was doubly distilled to prevent protein reaction. The dose was completely neutralized. The patient was examined prior to administration. His heart, lungs, and urine were negative. Six hours after the injection he vomited. The next day, October 27, he vomited once, and again once the following day, October 28. The third day after injection, October 29, he complained of ringing in the ears, pains in the back and a general feeling of malaise. His urine was examined again and found normal, as was the temperature, pulse and respiration. He received no medication save a laxative. On the fourth day, October 30, he felt better. Then, suddenly, at 4 p. m. he developed a general convulsion, which was followed by others from 15 to 30 minutes apart. In all he had 18 convulsions, and consciousness was never regained from the first. He died at 5 a. m. October 31. No paralysis was noted. During these seizures his temperature varied from 100 to 103, the pulse from 110 to 150, the respiration from 20 to 30, and the urine was markedly albuminous, containing a heavy cloud. Many granular casts were present. The autopsy revealed an acute nephritis and adhesions between the dura mater, the arachnoid, and the pia mater.

This case was probably one of arsenical poisoning, which resulted in nephritic lesions, which in turn were the cause of the convulsions. A history of scarlet fever was obtained from relatives. No skin reaction was present nor was anything noticed that indicated an increase of the syphilitic symptoms such as would point to the conclusion that the case was one of the class of reactions following injection of salvarsan, mercury, etc., known as the Herxheimer reaction.

Furthermore, the death occurred too late to be so classified unless under this title are to be grouped all fatalities following antisyphilitic injections regardless of their time of occurrence or length of time intervening between injection and death. But, as Milian points out in the Bulletin de Dermatologie et de Syphilographie of May, 1912, in commenting upon the deaths from "606" reported by Leredde: "In my opinion cases which do not show a reaction within 36 hours or which do not show any reaction in the skin lesions, mucous patches, or chancres are not properly to be considered under the head of Herxheimer reactions. On the other hand, it is more proper to classify them under the head of arsenical poisoning."

Weichselbaum, in his monograph "Uber die Pathogenese der Salvarsan Todesfaelle," considers such cases as directly due to arsenical poisoning and urges a special care in the examination of the kidneys prior to injection. He has shown in the analyses of numerous cases collected by him that the kidneys were nearly always directly involved. Some typical cases which he cites are that of Gauches, who injected a patient on the 17th of August with 0.6 grams of salvarsan. On the 21st vomiting occurred with general malaise, followed later by convulsions and coma. On the 22d the patient died.

Gaucher: Case 1: Bull. de l'Acad. Med. vol. 6, February, 1912. Twenty-four-year-old patient received three injections of 0.3 gram of salvarsan, during a period of 13 days. After each injection he experienced vomiting and fever. Six days after the last injection he had headache with convulsions. The latter recurred repeatedly. In seven days after the last injection he died. Case 2: Patient was injected on the 17th of August, with 0.6 gram of salvarsan. On the 21st vomiting occurred with general malaise, followed later by convulsions and coma. On the 22d the patient died.

Yahoube: Patient 25 years of age, female. Syphilitic infection of six years' standing present. Received December 17 one injection of 0.4 gram of salvarsan, followed by fever, malaise and vomiting. At midnight of the same day she lost consciousness. On the 21st of December deep coma supervened. On the 22d cyanosis occurred and death.

Wolbarst (Nw York Med. Jour., July, 1917): Patient 38 years of age with diagnosis of incipient tabes. Physical condition poor. Five-tenths gram of salvarsan were injected, followed by death 12 days later. Autopsy revealed chronic interstitial nephritis.

Hirsch (München. med. Wchnschr. No. 30, 1912): Injected July 1, with 0.5 gram salvarsan. Vomiting followed, but the following day felt completely well. On the 12th of July received a second injection of 0.5 gram. For two days he had fever, diarrhea, vomiting and slight icterus. A small quantity of albumin in urine. The third day after injection, tonic and clonic convulsions of the entire body occurred. Consciousness was lost. Cyanosis set in and death.

Kannengiesser (München. med. Wchnschr. No. 34, 1912): Patient aged 29. Had syphilitic injections of two years' standing, receiving treatment with salicylate of mercury and one subcutaneous injection of salvarsan on the 6th of April, followed by vertigo and difficulty of hearing. On the 28th of April received 0.5 gram of salvarsan intravenously. No reaction followed. On the 11th of May he received another injection of 0.5 gram, followed by slight headache the next day. Urine negative. Three days after the injection patient was attacked by tonic and clonic convulsions. During these convulsions he lost consciousness, and bloody froth appeared in the mouth. Later on coma set in. He died on the fifth day. The autopsy showed chronic leptomeningitis with brown atrophy and degeneration of the heart and kidneys.

Many other cases are obtainable, but the above were selected on account of their similarity to the one which happened at this hospital. The exact status of the Herxheimer reaction seems to be somewhat in doubt, but most authorities seem to regard it as a phenomenon observed after antisyphilitic treatment due to an aggravation of the syphilitic processes; characterized by exacerbations of skin lesions, mucous patches, gummata, and such nervous reactions as are seen in the augmentation of various paralyses and the lancinating pains of locomotor ataxia, etc. It would seem advisable as the literature abounds in fatalities occurring after both salvarsan and neosalvarsan injections, to ascertain by history and functional tests, the exact status of the kidneys in all cases where the slightest doubt exists as to the patient's ability to stand the dose.

COMMENT BY THE UNITED STATES NAVAL MEDICAL SCHOOL.

Although various causes have been ascribed to the accidents following salvarsan administration, the symptoms are very similar. Almost invariably, the susceptible individual has given an early warning by alluding to peculiar sensations of taste, flushing of the face, choking sensations, or nausea. These symptoms often disappear within a half hour, but further indications of a hypersensitive vascular system are followed in from three to six hours by more severe manifestations, including headache, nausea, vomiting, diarrhea, chills, fever, malaise, and pain in the back and legs. Suppression of the urine beginning at this stage is a most serious symptom and should prompt immediate treatment. With persistent vomiting and diarrhea collapse often occurs in from one to four days, ending in convulsions, coma, and sometimes death.

Pathology.—Lesions of the liver, kidney, stomach and intestines have been described, but it is surprising to find in the autopsy records of the more recent cases reports of normal organs or only cloudy swelling of the same.

G. E. Nesbitt[1] describes a case dying in convulsions and coma with petechial hemorrhages beneath the pericardium, beneath the pleura, in esophagus and mediastinum, with no cerebral hemorrhages. The heart, liver, lungs, stomach, intestines and kidneys were normal.

A. E. B. Wood[2] in a fatal case found only hemorrhages beneath the epicardium and a marked congestion of the surface of the brain with immense dilatation of the superficial blood vessels.

Willcox[3] concludes that in cases of death there is little but degenerative changes of a fatty nature or cloudy swelling with rarely localized lesion—as hemorrhage from a cerebral vessel.

Ehrlich[4] himself lays great emphasis on the lesion "encephalitis hemorrhagica," which he believes to be caused first by a liberation of endotoxins by the killed spirochaetes, and secondly, by a colossal dilatation of the irritated vessels through the direct action of the arsenic "when the normal regulator of the vascular system, adrenalin, is present in insufficient quantities in the blood."

Pearce and Brown[5] have studied extensively the lesions produced in the kidneys and adrenals of experimental animals by a number of arsenical compounds. They show that in the kidney vascular lesions, consisting of dilatation and congestion of the blood vessels, especially in the boundary zone of the cortex, with numerous hemorrhages, dominates the picture. However, degeneration and necrosis of the epithelium of the tubules is pointed out. In the adrenals the picture includes congestion, hemorrhage, cell necrosis with regeneration, and reduction of the chromaffin content.

In experimental work undertaken at the United States Naval Medical School we have been able to demonstrate an acute nephritis of hemorrhagic type and lesions of the adrenals, consisting of congestion, hemorrhage and necrosis of the medullary cells after moderate doses of salvarsan. Further work in this subject is planned.

In the case above reported sections from brain, liver and kidney were examined. The brain showed no lesion and no excessive congestion. The liver was normal. The kidney showed a thick, fibrous capsule. The blood vessels were everywhere dilated and packed with cells. Some of the smaller vessels seemed to be so affected as to allow the escape of blood. Hemorrhage was found throughout the tissue, but especially in the subcapsular zone. The glomeruli were enlarged and filled with blood, but in only a few cases was there free blood in the capsular space. In some instances there were desquamated epithelial cells and hyaline material lying between the glomerulus

and Bowman's capsule. The epithelial cells lining the tubules of the medulla were in many cases greatly swollen and desquamating. Most of the tubules contained some blood but in certain areas they were immensely dilated and filled with blood. Thus it would seem that this case resembles as far as the kidney is concerned experimental salvarsan poisoning. However, these lesions may well be a part of the picture produced by a paralyzed vascular system. In other cases the excessive dilatation of the cerebral vessels is probably a part of a similar process, as Ehrlich suggests, when there is an insufficient amount of adrenalin in the circulation.

Special emphasis is laid on the part which adrenalin in the circulation plays. From the work of Pearce and Brown and our work here it would seem that the injury to the adrenals is an important factor in the more serious cases.

Treatment.—Ehrlich early advised the use of adrenalin in the treatment of severe reactions after salvarsan. Wood[2] reports recovery in two cases after collapse had occurred when treated with 20 minims of a 1–1,000 adrenalin hydrochloride solution every four hours. A third case, untreated, resulted in death.

REFERENCES.

(1) Brit. Med. Jour., 1914, vol. 1, p. 778.
(2) J. Roy. Army Med. Corps, London, 1915, vol. 24, p. 272.
(3) Brit. Med. Jour., 1916, vols. 1 and 2, p. 473.
(4) Brit. Med. Jour., 1914, vol. 1, p. 1044.
(5) Jour. Exper. Med., 1915, vol. 22, p. 517.

A CASE OF SYPHILIS OF THE LUNG.

By A. B. Davidson, Passed Assistant Surgeon, United States Navy, and E. Callaway, Assistant Surgeon, United States Naval Reserve Force.

Syphilis of the lung, according to the authorities on the subject, is a rare disease. Osler states that it was found in only 12 cases in 2,800 autopsies at Johns Hopkins Hospital. Post mortems, however, do not really give a true basis for conclusions as to the frequency of the condition, as these cases are practically all tertiary, while in actual practice there are many cases of secondary syphilis of the lung.

The diagnosis of this condition is not hard if its possibility is kept in mind, but the symptoms are usually of such a mild type that they may be easily overlooked. In fact, the condition is in the majority of instances discovered in the course of a routine physical examination when the patient's complaint points elsewhere. The condition is associated with a low-grade temperature, ranging from 100° to

101°. The patient may or may not complain of a cough or of a slight pain in his chest. There is a sensation of weakness, dizziness, and pain in head and back, which may be misleading. On physical examination an area of dullness is found, there is bronchial breathing, increased fremitus, but few or no râles. The primary sore may be found or a secondary rash may be appearing. Examination of the sputum is negative for acid-fast organisms and a total leucocyte count shows a very slight or no increase above the normal. When given antisyphilitic treatment the condition rapidly clears up. The Wassermann reaction is, of course, positive.

F. M., seaman, second class, came to the sick bay on June 27, 1917, complaining of headache, weakness and a slight pain in his chest. On examination an area of consolidation involving the upper half of the right lung was found. All lymph nodes were swollen and a small condyloma was found beneath the prepuce. The patient admitted having had a chancroid there four months previously. The temperature was 101°. The next day his condition was the same and a total leucocyte count gave only 7,500. On this day and the next the sputum was examined for the B. tuberculosis, but none were found. There was noticed a beginning alopecia and mercury in the form of the succinimide was given intramuscularly. By the 6th of July six doses had been given and the pulmonic condition had entirely cleared up, hair was growing on the bald areas, and the condyloma was almost gone. The patient was transferred to the United States Naval Hospital, Norfolk, Va., where the Noguchi test was found to be 4 plus positive.

That this was a case of syphilis of the lung is apparent, as the low temperature and normal leucocyte count rule out pneumonia. Tuberculosis is eliminated by the absence of the bacillus in the sputum and the rapidity with which the condition cleared up when mercury was administered.

Two other cases almost identical with the one given above have been observed, and it is believed that the condition is more common than is usually supposed.

A CASE OF FRACTURE OF THE OS CALCIS.

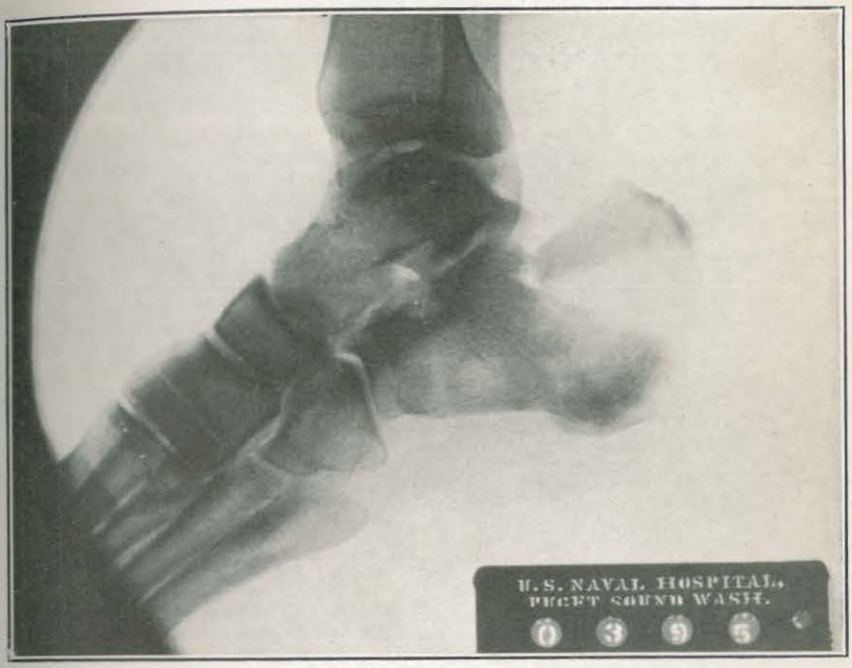
By G. S. WHITESIDE, Assistant Surgeon, Medical Reserve Corps, United States Navy.

Fractures of the tarsal bones, especially of the os calcis, are unusual except as the result of crushing injuries to the foot. The problem of diagnosis is a difficult one, where the calcaneum alone is injured, both because swelling of the foot and ankle obscures the outline of the bones and because it is often impossible to elicit crepitus on account of the wide separation of the fragments.

Hamilton states that "the calcaneum is occasionally broken by lateral pressure but much more often by a fall upon the foot or rather the heel." Several cases have been reported of fracture of the tubercle of the os calcis by falling upon the foot when in the position of varus. This lesion has been ascribed to the sudden stress on the middle portion of the external lateral ligament. Gray's Anatomy describes this as follows: "The middle fasciculus (ligamentum calcaneofibulare), the longest of the three parts of the external lateral ligament, is a narrow rounded cord passing from the apex of the external malleolus downward and slightly backward to a tubercle on the outer surface of the os calcis, near the middle of the external surface of the bone. This ligament is covered by the tendons of the peroneus longus and brevis." Sometimes the calcaneum may be fractured by a rending force owing to the sudden action of the gastrocnemius-soleus muscle. This may occur in jumping or in falling upon the toes with the foot in the position of varus. In the event of such an injury the lower part of the insertion of the tendo Achillis may be torn away from the bone leaving it attached only to the upper fragment. In such cases the upper fragment is pulled more or less vertically upward. The consequent separation of the fragment from the main body of the bone is a wide one, and so crepitus can not be obtained even when pressure downward is made by the examiner's hand.

Whether this particular lesion of the os calcis is always caused by a fall upon the toes with the foot in the position of varus or whether it may sometimes be caused by a more direct violence, as in falling from a height upon the heel, we have no available statistics to show. When X-ray examination is not to be had the diagnosis may be very baffling. Under ether a hard mass, giving the impression that it might be bone, can be felt above the normal upper level of the os calcis, unless swelling of the foot and ankle is too great. In the case here reported the man was washing windows on the outside of the marine barracks. He fell, while facing the building, alighting upon his feet in such a way that one of them violently struck the edge of the concrete sidewalk. The man was examined within a few minutes of the accident. Consequently very little swelling of the foot had taken place. Even so the diagnosis of the exact lesion was in doubt until an X-ray plate, taken by Passed Assistant Surgeon R. G. Davis, made the position of the fragment very evident.

The apparatus for the nonoperative treatment of fractures of the os calcis, as generally advised, is some form of slipper or shoe to the heel of which is attached a cord. This cord is to be fastened posteriorly to a bandage about the thigh just above the knee. Or the foot may be put up in a position of extreme varus and held so either by an anterior dorsal splint or by plaster of Paris. These



Fracture of os calcis.

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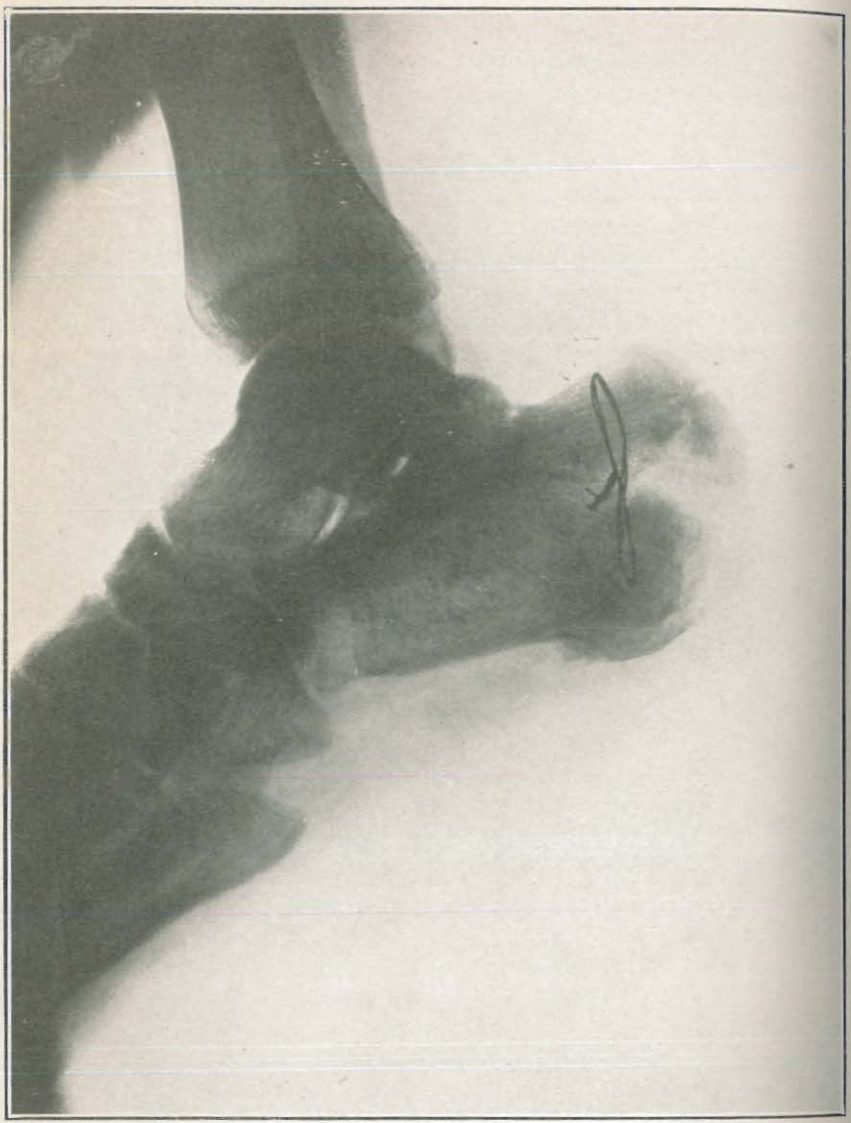

Approximation of fragments immediately after operation.

methods are merely mentioned here to be condemned, unless the circumstances are such as to contraindicate open operation for fixation of the fragments.

Any mechanical attempt at reduction and fixation can be only partially successful in regard to approximation of the fragments and will therefore entail a very long convalescence. Open operation, wiring of the fragments and fixation in position of varus were therefore the measures decided upon for this case.

Upon exposing the bone lesion to view by a long semilunar incision, convexity backward, on the outer aspect of the foot, it was readily seen that approximation was not possible by merely putting the foot in position of varus. Therefore an intrathecal tenotomy of the tendo Achillis was done as high as possible in the upper angle of the wound. After drilling, one doubled strand of silver wire was passed, without difficulty, from above downward through both fragments. Tension upon this wire gave close approximation on the outer side of the bone, and a near approach to approximation on the inner side. It was deemed impossible to pass another wire on the internal side without an incision for the purpose on that side. This was not considered justifiable. The wound was closed without drainage and the foot put up in a position of varus.

Very little pain was experienced after operation. Convalescence was uninterrupted. The following is the health record in the case:

MEDICAL HISTORY.

A. & T. Name of patient, Merriam, Howard S.
Marine Barracks, Puget Sound, Wash.
July 28, 1917.
Fracture Os Calcis, right; simple.
Line of duty; from a fall sustained while washing windows.
Transferred to United States Naval Hospital for further treatment.

M. G. WRIGHT,
Assistant Surgeon, United States Navy.

R. A. United States Naval Hospital, Puget Sound, Wash.
July 28, 1917.
Fracture, simple; Os Calcis, r. "G."
Origin: Duty, as related above. X-ray shows fracture of os calcis at insertion of tendo Achillis, with wide separation of fragments.
Open reduction advised and accepted.
7–30–17. Operation: Semilunar incision inner side heel. Tenotomy of tendo Achillis about 2 inches above attachment. Double strand of silver wire through upper and lower fragments. Approximation good. Foot put up with anterior splint in extreme extension.
7–31–17. Temperature normal.
8–3–17. Splint removed. Plaster of Paris applied, keeping foot same position.
8–11–17. Wound all healed.

8-28-17. X-ray shows excellent result. Can now walk on foot. All dressing off.

GEO. S. WHITESIDE,
Assistant Surgeon, M. R. C., United States Navy.

Sept. 10, 1917. Progress continues favorable. Walks well. No soreness.

9-12-17. On 10-day leave of absence.

D 9-24-17. Discharged to duty; cured.

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WALDO RICHARDSON,
Assistant Surgeon, United States Naval Reserve Force.

Approved:

A. R. WENTWORTH,
Medical Director, United States Navy, in Command.

The X-ray picture taken by Dr. Davis immediately after operation showed good approximation of fragments.

Another X-ray taken at the end of two months showed excellent position and wire still in place.

The eventual functional result is reported as good. Discharged to duty, well, 58 days after operation.

This or some similar method of open operation would seem to be best for such an injury, obtaining as it must, accurate approximation, rapid repair, and consequently fewer days' loss of service.

EXTRACTION OF A SUPERNUMERARY TOOTH.

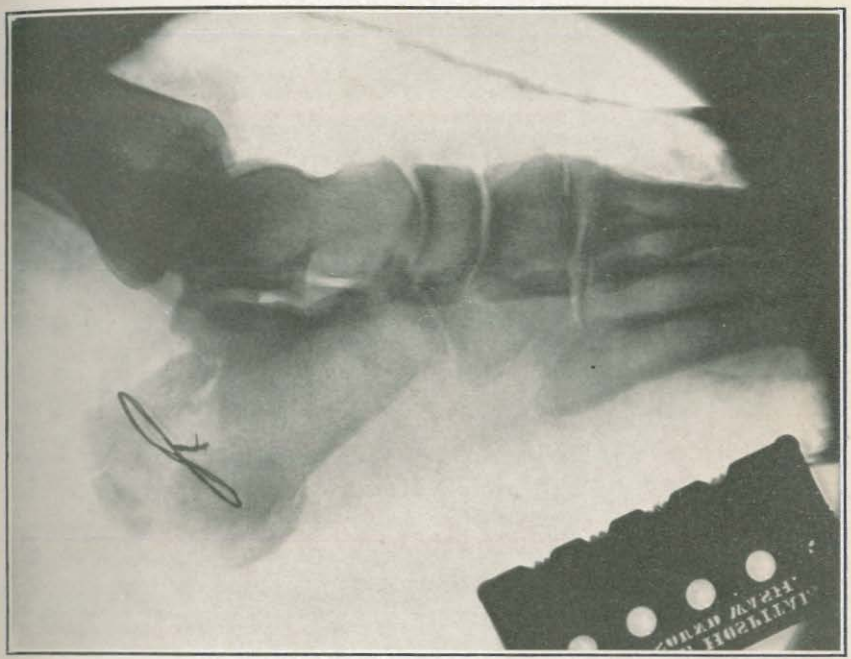
By W. A. CAUCH, Dental Surgeon, United States Naval Reserve Force.

It is a well-known fact that the teeth of mammals are 44 in number, and, in the evolution of the human, man has lost 4 incisors and 8 premolars or bicuspids. Many authorities suppose that supernumerary teeth are some of these suppressed teeth reappearing in a rudimentary form. Supernumerary teeth are usually found in the incisor region and almost always erupt just before the permanent set, causing irregularities in the incisors.

Anomalies seem to be not uncommon, as they appear in almost every collection of models of the teeth. They sometimes remain embedded in the alveolar process and are revealed only by probe or skiagraph.

A man with a supernumerary tooth recently reported at the dental office, headquarters of the twelfth naval district. The tooth was extracted under local anesthesia. It was located in the median line of the hard palate about half an inch back from the alveolar process.

Supernumerary or anomalous teeth very rarely resemble any of the typical tooth forms and are mostly peg shaped or conical, as was true in this case.



View of os calcis two months after operation.

PROGRESS IN MEDICAL SCIENCES.

REVIEWERS.

Surgeon H. S. CUMMING, United States Public Health Service.
Passed Assistant Surgeon G. B. TRIBLE, United States Navy.
Passed Assistant Surgeon D. G. SUTTON, United States Navy.
Passed Assistant Surgeon R. W. MCDOWELL, United States Navy.
Passed Assistant Surgeon G. F. CLARK, United States Navy.
Passed Assistant Surgeon W. A. BLOEDORN, United States Navy.
Passed Assistant Surgeon G. B. CROW, United States Naval Reserve Force.
Assistant Surgeon J. E. HOUGHTON, United States Navy.
Assistant Surgeon R. A. KERN, United States Navy.
Dental Surgeon J. R. BARBER, United States Navy.

GENERAL MEDICINE.

BASSETT-SMITH, P. W., LYNCH, G. R., MANGHAM, S. **Investigation of carrier problem in prevention of cerebro-spinal fever (examination of 11,000 non-contacts).** J. Roy. Nav. M. Serv., London, October, 1917.

A continuous examination has been carried out at the Royal Naval College, Greenwich, for carriers of meningococcus in the naval forces employed at and passing through the Royal Naval Depot at Crystal Palace.

All men on entering the depot and as many as possible of those about to be drafted out were tested.

The fact that the three investigators and laboratory staff remained unchanged adds to the value of the observations.

The number of carriers detected was considerable (676) and three points were established:

1. The percentage of carriers found this year is much higher than it was during last season—(6.14 per cent, as against 1 to 2 per cent).

2. On dividing the men examined into two groups, new entries and drafts, a higher percentage of carriers is found among the latter—(4.48 per cent, as against 10.08 per cent).

3. The carrier stage is more persistent than was the case last year.

The percentage of positives among new entries increased steadily up to the end of May, after which time there were indications of a decrease, probably due in part to better climatic conditions. Occasionally there would be a batch in which the percentage of positives

rose very high. This was marked in a number of merchant seamen and possibly due to the men having come from overcrowded areas.

There was a much greater increase in the percentage of positives among the men who had been some time at the depot and were to have been drafted out. The investigators attribute this to local infection.

The detected carriers have been completely isolated until they have given two consecutive results at weekly intervals. They are then sent to duty, but before being discharged they have to obtain four consecutive negatives.

The weekly records show how frequently the former give subsequent positive results, i. e., are "intermittent carriers." Necessarily these and other undetected carriers associating with large bodies of men in a depot must tend to disseminate the organism and cause a higher incidence among the residents of the depot. This view is strengthened by the demonstration of changes of type found in carriers.

The persistency of the carrier stage has been a marked feature. Of course, a large proportion of the cases came under Gordon's heading of "temporary carriers," i. e., one positive was obtained. The men were segregated, by treatment or normal processes, became free and four successive negatives were obtained. On the other hand, cases with five, six, seven, or even nine positive results were obtained, generally with some intermittency.

The following gives the frequency of positives found per carrier of the 676 carriers discovered in the first 11,000 noncontacts examined, and the record of their subsequent swabs is considered up to June 6, 1917.

Number of times found positive	1	2	3	4	5	6	7	8	9
Number of cases	459	126	49	23	13	3	2	0	1

A number of the men were still under observation, as they had not shown four negative results. It will be seen that the temporary carriers were far more numerous than all of the others. It has been decided that the very chronic carriers, if not cleared up in three months, are to be discharged from the service.

Including the examination of contacts, recovered cerebro-spinal fever cases, and reexamination of carriers up to June 6, 1917, the total number of swabs dealt with was 14,598, of which 1,103, or 7.5 per cent, gave positive results. Of 11,000 healthy noncontacts 676, or 6.14 per cent, were found positive.

The total number of cultures from these 11,000 cases, to which the agglutination test was applied, using Flexner's serum, was 1,609, of which 676, or 42.01 per cent, gave positive results.

Occurrence of some types of swab records is given below:

+	+	—	—	—	—			53 of this type.
+	+	+	—	—	—	—		9 of this type.
+	+	+	+	—	—	—	—	3 of this type.
+	—	+	—	—	—	—		19 of this type.
+	—	—	+	—	—	—	—	15 of this type.
+	—	—	—	+	—	—	—	— 11 of this type.
+	—	+	+	—	—	—		1 of this type.
+	—	+	—	+	—	—	—	— 3 of this type.

A table is appended showing the number of cases each month and the results of examination of their contacts, together with the figures relating to noncontacts. The highest incidence of cases occurred during the months of January, March, and April, when the weather was exceptionally cold.

Month.	C. S. M. cases.	Contacts.		Noncontacts.									Total swabbed.
		Total.	Positive.	New entries.	Positive.	Per cent.	Drafts.	Positive.	Per cent.	Officers.	Positive.	Per cent.	
1916.													
December...	2	12	2	1,490	21	1.4	.....	....	.....	....	....	.....	1,490
1917.													
January.....	4	25	1	1,056	38	3.59	867	43	4.95	115	3	2.60	2,038
February....	2	4	....	841	33	3.92	676	36	5.32	71	6	8.45	1,588
March.....	6	28	7	1,515	73	4.81	802	84	10.47	67	3	4.47	2,384
April.....	4	21	8	1,158	63	5.44	666	97	14.56	141	4	2.83	1,965
May.....	1	6	1	1,717	121	7.04	380	82	21.57	107	11	10.28	2,204
Total....	19	96	[1] 19	7,777	349	4.48	3,391	342	10.08	501	27	5.38	.....

[1] 19.8 per cent.

From the 676 noncontact carriers 381 examinations were made to determine the type of Gordon strain, which was the causal organism. The following results were obtained:

Gordon type	1	2	3	4
Number of times found	167	176	2	31

In five cases the cocci were agglutinated by both types 1 and 2. There were 19 cases of cerebro-spinal fever during the period and of 14 contacts tested, by far the largest number showed type 2. Technique: The swabs are taken by one officer (using West's method) and sown on plates which are then spread by another officer. The medium which gave the best results for plates was trypsin legumin agar to which 1.5 per cent of laked ox blood (prepared according to Wilson, Brit. Med. Jour., Dec. 30, 1916) was added just before the plates were poured. The plates are incubated for 24 hours at 37 C. and suspicious colonies are examined by Gram's method. Colonies are

translucent, slightly convex, and somewhat milky by reflected light, and are easily recognized.

The writers have eliminated the use of the glucose and saccharose peptone waters and inoculate from the plate directly on trypsin legumin agar slopes which are incubated for 24 hours. From these emulsions were made in formalinized saline (0.5 per cent phenol now used instead). The emulsions are heated at 60 C. for 30 minutes and tested for agglutination with Flexner's polyvalent serum at dilutions of 1 in 100 and 1 in 200; controls with normal serum, 1 in 50 being employed. The agglutination tubes are heated at 55 C. for 18 to 24 hours and then read off.

The investigators advocate the use of Flexner's polyvalent serum. They found that a pure pathogenic meningococcus from cerebro-spinal fluid has failed to agglutinate with any of the four Gordon sera though reacting well with Flexner's serum. This method also saves time and material. They are of the opinion that morphologically and tinctorially correct cocci can only be absolutely identified as meningococci by agglutination with specific meningococci serum. The appearance of colonies on the plate and the sugar reactions are far too comprehensive and take too much time.

Preservation of living cultures of meningococci.—The investigators have found trypsin wheat-germ agar in stab cultures most satisfactory, cultures living for six weeks when evaporation is prevented. Egg medium is also good, cultures living for a month. Cultures from the nasopharynx did not survive well. The authors, in reply to the criticism that carrier work is of little value, owing to the inability, in the light of present knowledge, to differentiate between pathogenic and nonpathogenic strains of meningococcus, conclude that in widening the net by improved technique, etc., so as to include, isolate and treat all carriers, good work is being done to modify the incidence of the disease still seriously on the increase. "As this year the total carriers have been shown to be far higher than last year, and assuming that the ratio, although unknown in figures, remains the same between pathogenic and nonpathogenic strains, one hesitates to speculate upon what might have been the disease incidence if this isolation had not been carried out."

The authors note that in none of their cases did a carrier develop the disease, though capable of infecting others, but of seven recovered cerebro-spinal fever cases three showed meningococci in the nasopharynx, the organism having been discovered five times in 31 examinations. Finally the authors are strongly of the opinion (1) that it is of the first importance, as suggested by Col. Gordon, to make every endeavor during the summer months to detect and eliminate or cure all chronic carriers who may be present in the depots before the commencement of the next winter season; (2)

that the importance of very thorough ventilation of all dwelling accommodations should be recognized as a preventive measure. They point out the fact that at the Royal Marine Barracks, Deal, where these precautions were observed, not a single case occurred though the disease was prevalent in the town itself.

(H. S. C.)

FERRY, N. S. **The rationale of pollen extract therapeusis of hay fever.** Interstate Med. Jour., September, 1917.

The theory is generally accepted that the symptom complex known as hay fever is due to a toxemia depending upon a parenteral digestion of proteins of certain pollen. Although Dunbar's work in establishing the etiological relationship of pollen to hay fever is recognized, it has been proved that his conception that pollen extract is a true toxin is erroneous. Dunbar, Noon and Freeman demonstrated that the application of very minute traces of pollen or its aqueous extract to the conjunctival or nasal mucous membrane produced the most intense symptoms of hay fever in persons sensitive to that particular pollen, and produced no symptoms in those not suffering with the disease. This experiment not only afforded a means of differentiating between those individuals subject to one pollen from those subject to another, and of determining the exact resistance of any patient to any given pollen, but it also proved that hay fever depended upon an individual predisposition. Coupling this predisposition with the fact that pollen extracts are considered of a protein nature led many, following Wolff-Eisner, to believe that anaphylaxis was the underlying cause. This conception that hay fever is based upon anaphylaxis or protein-hypersensitiveness presupposes that the patient must at some previous time have been sensitized, and according to Koessler this sensitization may have been either inherited or acquired. Several explanations are offered regarding the manner in which this sensitization may be acquired, but whatever the method of its acquirement, Cooke, Flood, and Coca believe that the mechanism by which it may be relieved is the same as that of desensitization in experimental anaphylaxis.

The author believes that desensitization against pollen protein can best be accomplished by the subcutaneous route, starting with extremely small doses of standardized aqueous extract of the pollen and gradually raising the tolerance by increasing the size of the dose. By using the method of Noon and Dunbar to make correct diagnosis and to determine the size of the initial dose he believes that there is practically no danger in the treatment, provided single extracts are used. He has found that aqueous extracts prepared according to his own method remain active for at least one year.

In reporting 118 cases treated with ragweed pollen and 9 cases treated with timothy pollen the author states that 71 per cent of cases were relieved of practically all symptoms, and 16 per cent were more or less benefited. Even in the cases most benefited, the effects gradually lessen and disappear entirely in two or three years.

(G. B. C.).

BONIME, E. **The utilization of the immune response in renal tuberculosis.** Am. Jour. Med. Sc., October, 1917.

Owing to the absence of characteristic symptoms and the lack of training of the average physician in the diagnosis of urinary diseases, renal tuberculosis is usually not recognized until great and irreparable harm has been done. Without disparaging the value of cystoscopy and guinea-pig inoculation as diagnostic aids, the writer makes a plea for the use of tuberculin, given subcutaneously, as a valuable diagnostic method and one that the average physician can use.

The usual "present-day" treatment of the disease is confined to hygienic, dietetic, and climatic measures in those cases recognized fairly early, with the addition of nephrectomy in more advanced cases. Few, if any, advocate the removal of the kidney in early cases. In the writer's opinion the value of immuno-therapy is not sufficiently appreciated. The general physical condition of early cases is usually good, but the measures employed in their treatment are not sufficient to start the immune response, because the mechanism of immunity is faulty. The stimulation of this mechanism by the use of tuberculin appears logical, and in practice it gives good results. He believes that with the safer method employed at the New York Polyclinic Hospital there is no difficulty in its utilization in private practice.

Prophylactic immunization against mixed infection he regards as also of very great importance. Bacteria are constantly being carried through the kidneys, and in the tubercular kidney other organisms find a favorable soil for growth. Inoculations with a mixed-stock vaccine of colon bacilli, staphylococci, and streptococci are advocated in every case. If mixed infection occurs, it should be treated by autogenous vaccine in addition to the use of tuberculin. Too many blame tuberculin for failure to cure a mixed infection.

So much for fairly early cases. What of the other and radical method of treatment? The removal of the kidney can only remove a portion of the infection. The primary source of infection, usually the mesenteric glands, remains, and removal of one kidney does not prevent the spread of the infection from the primary focus to the other kidney. On the contrary, the lowered resistance produced tem-

porarily, at least, by the shock of the operation tends to increase the chance of such infection. The operation itself can not increase the individual's immunity. Bonime believes that it is better to use tuberculin, even in advanced cases, in the hope of increasing the resistance and effecting a possible walling off of the infection.

The complexity of the mechanism of the urinary apparatus should always be borne in mind, for symptoms due to distorted or destroyed portions of this apparatus may persist after the tubercular process is no longer active, and such symptoms be wrongly interpreted. He believes that an early diagnosis and the prompt use of tuberculin in the treatment of the disease would result in a far more favorable prognosis.

(G. B. C.)

TWICHELL, D. C. **Reactions to altitude in the tuberculous.** Am. Jour. Med. Sc., December, 1917.

The author has had opportunities for extensive observations on the tuberculous at altitudes varying from near sea level to from 5,000 to 6,000 feet, and his conclusions regarding the value of altitude in the treatment of tuberculosis should be of interest not only to workers in this particular field but to the general practitioner who is called upon to advise and treat this class of patients.

The following is a summary of the changes that take place in the blood, blood pressure, and tuberculous symptoms upon removal from a low to a high altitude.

All investigators who have worked along these lines are agreed that the red blood corpuscles are increased by a high altitude. Low barometric pressure has been shown to increase the activity of the red bone marrow, as evidenced by its hyperæmia and increased number of nucleated red cells. The Anglo-American expedition to Pike's Peak showed that this increase was actual and not relative. It has been shown that this increase is probably temporary, the period of abnormal increase varying in different individuals. Increase in the haemoglobin content of the blood accompanies transfer to high altitudes. There is marked increase in the mononuclear lymphocytes in the circulating blood at elevations of 6,000 feet. An increase of blood platelets has been demonstrated by Webb but the function of these platelets is not clearly understood as yet. The modification of blood pressure at high altitudes appears to vary with the individual, there being a rise in some cases and in others no change or even a lowering of the pressure.

Tuberculous symptoms such as cough, expectoration, and fever are not strikingly altered by residence at high altitude. The gain in weight in favorable cases corresponded with the gain usually ob-

served at low altitude but advanced, semichronic and chronic cases are liable to lose weight or not gain weight or gain very slowly, on coming into a high altitude in dry seasons, in the face of clinical evidence or improvement in symptoms, signs, and general well-being. In high and dry altitudes night sweats were of very rare occurrence after the first few nights of change from low altitude. The author believes hemorrhage from the lungs to be rarer at high altitudes than at lower levels. Pleurisy with effusion is more rare at high altitudes.

The author believes that the circulatory mechanism works to better advantage at altitudes of moderate degrees (5,000 to 6,000 feet) than at sea level. The lowered atmospheric pressure may at first cause a disproportionate dilatation of the venous and arterial systems and so increase the capacity of the blood cavities of the body. The blood-forming organs would respond to such an increased capacity as they would to loss of blood by increasing the elements of the blood. The thinner walls of the veins may result in partial stasis of the venous circulation which might have a distinct beneficial effect on disease lesions following the theory and results obtained in Bier's hyperemia treatment.

Mountain sickness offers a similar example of circulatory change. The anoxemia which results from the lower barometric pressure depresses the cardiac function resulting in accumulation of blood in the venous system. This would lead to plethora of the lungs and general venous system and provoke the clinical symptoms characterizing mountain sickness. Various observers have confirmed the view that active absorption of oxygen by the alveolar epithelium is an important, if not the only force behind its appropriation by the blood when the CO_2 tension in the alveolar air falls below a certain critical tension. It has been shown that the suboxidation of the tissues resulting from a critical lowering of alveolar oxygen tension is accompanied by the accumulation of acid substances in the blood which stimulate the respiratory center and lower its threshold of irritability for CO_2.

A large proportion of tuberculous cases on coming into an altitude show an immediate reaction as evidenced by such symptoms as increased shortness of breath, increased cough and expectoration, cyanosis more or less marked, and an increase of moist sounds in the lungs. This immediate reaction subsides in a few days.

A certain proportion of cases show no reaction at all. Another group of cases, chiefly chronic, shows symptoms of sudden toxemia, such as high fever, rapid pulse, nervousness and insomnia, diarrhea, and signs of increased inflammation in the lungs. These cases usually recover rapidly, as is the case in classical tuberculin reactions. These reactions to altitude frequently are followed by periods of marked

improvement in the signs and symptoms of disease, as is also observed after artificial tuberculin reactions.

It would appear that there is definite scientific basis for the time-honored faith in the curative effect of altitudes in the treatment of tuberculosis.

(W. A. B.)

CAVALLINI, E. **Prevention of malaria.** Ann. Med. Navale e Coloniale, II, p. 364, 1914.

The Italian naval vessel *Volturno* was for two years in the waters off a highly malarious section of East Africa (Dar-es-Salam and Mombasa). Each man on board received daily a compressed tablet of a quinine salt, 0.20 gram. The crew was lined up on deck every morning and the administration of the prophylactic dose was conducted under the supervision of an officer. The ship was anchored as far as possible from shore, liberty was granted only till sundown, and all electric bulbs were tinted blue to reduce the attraction of mosquitoes by light.

In a complement of 150 officers and men there developed but four cases of paludism. Fifty per cent of the crew of a German naval vessel, on which was employed the prophylactic method of administering 2 grams of quinine a week, divided into two doses, developed malaria. The German medical officer was so impressed with the difference in health conditions on the two ships that he called on the *Volturno* and requested the medical officer of that ship to inform him of the methods adopted.

MENTAL AND NERVOUS DISEASES.

FELL, E. W. **Notes on diagnostic value of spinal fluid and Wassermann test in psychiatry.** Am. Jour. Insan., July, 1917.

From a series of 215 cases the author gives a concise and valuable expression of his opinion relative to certain fairly well-known facts in relation to spinal fluid findings in psychiatry. He brings out no essentially new facts, but emphasizes many of the formerly recognized conditions, and because of the fact that his conclusions were drawn from results obtained in such a large number of cases it is believed that they are particularly valuable.

It is recognized by most authorities that the nervous tissue is sensitized at the time of the primary and secondary symptoms in luetic infections. The Wassermann at this time is usually positive. Some claim that a particular strain of spirochaete predisposes to cerebral

spinal syphilis and others that the resistance of the individual plays an important rôle in the development or nondevelopment of cerebral spinal symptoms subsequent to the primary infection. It is a well-recognized fact that very frequently we get a negative history as to severe secondary symptoms in cases of syphilis that subsequently show symptoms of cerebral spinal involvement. In a large percentage of cases of paresis developing in men of the service and subsequently sent to St. Elizabeths Hospital for treatment we are unable to find a definite history of either primary or secondary symptoms. In these cases we may get a history of chancroid with no subsequent skin lesion, or we may get a history of a definite primary lesion with no record of secondary symptoms of any kind. However, there is, of course, a large percentage of cases that seem to have the typical luetic symptomatology, and these usually are apparently cases with very severe infections, and run a more or less rapid course. The author attempts to show that during the secondary stage there is a certain chain of symptoms which usually develops, but which is frequently unrecognized. The symptoms are referable to the mental field and appear as evidences of mild psychoses, the type simulating frequently the manic-depressive group, more frequently the manic phase.

In 215 luetic cases the average cell count was 50 and the highest 285. Ten of the 285 in the nonluetic group had over 6 cells. Seven of these 10 cases turned out to be organic in nature, and the remaining 3 were of dementia praecox. In the luetic group no relation was noted between the cell count and globulin increase, except that in acute cases there was a greater amount of globulin and a larger number of cells. In the luetic group 91.6 per cent of the cases gave a positive Wassermann reaction with the blood serum. With the spinal fluid in the luetic group 30 of the 215 cases gave a negative Wassermann in one of the 3 dilutions used. Seventeen of these 30 had low cell counts. Of the nonluetic group, 22 of 285 gave a positive Wassermann in some of the fluid dilutions, but in the majority of the cases the Wassermann was negative. The cell count and globulin increase was not unusual in the organic cases. The author expresses the opinion that a diagnosis of paresis should not be made unless neurological signs are present, as well as definite laboratory findings. As to the Lange reaction the author found that it was typical in cases of definite paresis. In cerebral spinal syphilis he got a paretic reaction in a high percentage of cases. Nonspecific organic cases may give the same reaction as with paresis. He emphasizes the fact that in cases of paresis, with remission, showing a positive spinal fluid finding should not be considered as a cure.

(D. G. S.)

SCHWAB, S. I. The newer concepts of the neuroses: Their clinical value. Am. Jour. Med. Sc., September, 1917.

Just at this time, when there is apparently so much diversity of opinion as to the actual value of the Freudian and various allied theories in their relation to the treatment of psychoses and psychoneuroses, the above-mentioned article is considered to be quite timely and to be recommended for careful reading by those who are interested in this phase of the work.

To begin with the author gives very clear definitions of various neuroses according to the present-day classification. He considers the neuroses as a whole to be merely clinical pictures of the diseases which are primarily psychogenic in origin. He divides the neuroses under the two general headings of, "conscious" and "unconscious." Under "conscious" he places neurasthenia, hypochondriasis, and psychasthenia; in the "unconscious," hysteria and the compulsion neuroses. He then goes briefly into the principles of the Freudian theory, the theory of Janet, the theory of Babinsky and finally that of congenital and acquired inadequacy. He reminds us that under the Freudian theory the psychoneuroses are divided into two groups. Neurasthenia is a neurosis of anxiety being due to various sexual troubles, while hysteria and obsessions are due to sexual causes of traumatic origin occurring in childhood. Psychiatrists limiting themselves entirely to the Freudian theory have been more or less discredited from time to time because of the fact that as a result of their psychoanalysis of various cases they have failed to involve sexual matters as a basis for the existing condition. The author recognizes the fact that sexual disturbances are the cause of a large number of cases of neuroses under treatment, but emphasizes the importance of remembering that the method of Freud is the important element. To uncover the causative factors which have been buried in the patient's subconscious mind is the goal to which every psychoanalyst should strive. There have been a number of cases in the reviewer's experience that have not responded to psychoanalysis because of the fact that the physician formerly handling the case laid stress on sexual matters as being the main causative factors underlying the illness, when as a matter of fact the condition was not sexual in character, but was in the form of some unpleasant incident which had occurred at an early date in the patient's life and had been repressed for obvious reasons. A full knowledge of any case can only be gotten by careful and detailed review of the patient's life from childhood; analysis of character, personal association and dream interpretation. The author lays special stress on suppression by the patient of unpleasant ideas, which have set up a conflict resulting in outward expressions of seemingly incomprehensible symptoms from the motor and sensory fields. (D. G. S.)

SWIFT, H. F. **Types of response in treatment of syphilis of the central nervous system.** Am. J. Syph., St. Louis, July, 1917.

After discussing modern treatment of syphilis of the central nervous system, in a more or less exhaustive manner, the author cites numerous illustrations giving case histories, spinal-fluid findings, and response to treatment in each case. In conclusion, he reminds us that it is necessary to determine the character of the pathological process present before instituting treatment; that only lesions due to inflammation or exudation respond entirely to therapeutic measures, and that degenerations are rarely, if ever, affected by such means. In cases of tabes dorsalis improvement is noted from the general administration of salvarsan and mercury. On the other hand such cases may require intraspinal treatment which leads in many cases to a permanent arrest of the degenerative process. Treatment should be continued until the spinal-fluid findings are negative. In paresis spinal treatment may increase the number and length of remissions, but the ultimate hope for recovery is slight. When a typical paretic curve is gotten with Lange reaction, even though the clinical symptoms are not typical, intensive treatment should be begun at once for it is only in the early case that we may hope to derive much real benefit from any form of treatment. All treatments should be regulated by spinal-fluid findings and not by clinical symptoms. (D. G. S.)

SURGERY.

GUILLOT, M. and WOIMANT, H. **Sterilization and closure of suppurating fractures.** Surg., Gyn. and Obstet., November, 1917.

After four months of experimentation the writers affirm that fractures in full process of suppuration can be sterilized and closed. They use a special application of the Carrel method. The technique is as follows:

Preliminary disinfection: Operation immediately following the infliction of a wound has been found to be dangerous, often followed by septicemia and death. Infection should first be reduced by discontinuous flushing with Dakin's solution. The progress of disinfection is watched on the bacteriological curve on the chart. Films are made daily from the highly infected areas and the bacteria counted. They appear in large quantities after two days, then diminish rapidly, except in old fractures, where they appear sooner and diminish more slowly.

Operative treatment: When the existence of foreign bodies, such as fragments of projectiles, clothing, detached bone, etc., is noted, an operation becomes necessary at once. In flat bones or the epiphyses of long bones the treatment is comparatively easy and areas of

osteitis are curetted with the gouge forceps. Old fractures of long bones present more difficulties and the commonly used methods of curettement and abrasion produce infection of the bone marrow and clots of blood in the wound.

The factors to be considered in an operation are: Incision. The incision need not extend beyond the fistula or wound of first operation. Do not use iodine in preparation, as a burn will be produced when Dakin's solution is used later for flushing. All infected tissue should be excised, but enough skin should be retained for future closure of the wound. Osteitis of the periosteal callus is removed by a curette introduced into the infected cavity. In recent fractures no callus is found, and the bone ends are easily exposed. Sequestra may be found in the muscles, focus of fracture, or medullary canal. They should be removed from the muscles after being located by the X-ray. A careful search must be made for those in the medullary canals, for they are often responsible for the absence of the medullary plug observed in the course of the consolidation of fractures. Splinters, decaying or detached, should not remain in the wound, only those necessary for consolidation being left.

Bone ends: The writers are quoted in the following conclusions: (*a*) "A fracture in which the bone ends are obturated causes no postoperative reaction." (*b*) "A fracture in which the bone ends are not occluded produces an intense reaction, if the cavity of the medullary canal is not plentifully flushed with the antiseptic solution." (*c*) "A fracture in which the nonoccluded bone ends have been widely opened by surgical intervention will produce no reaction." Therefore (1) "the surface of the medullary plugs should be explored with a curette in order to ascertain that there is no communication with the subjacent medullary canal and that no sequestrum is inclosed;" (2) "the medullary canals which have remained open should be hollowed out with a pince gouge in such a form as to produce a wedge-shaped cavity communicating freely with the flushing tubes."

Sterilization: It was found that the most highly infected parts of the wound were the blood clots near the severed bones. To prevent their formation the bleeding vessels were clamped and ligated, then sterilized with salt solution at 40 C. During the first two days the wound is flushed out every half hour of the day and every hour of the night with hypochlorite prepared electrolytically. This procedure has been found to decrease the bacteria to below three per field after a varying length of time, and then after several days elapse the wound is ready to close.

Closure of the wound: In sterilized fresh fractures no difficulty is encountered in closing the wound. The edges of the wound are freshened, profuse bleeding avoided, horsehair sutures used, bone ends and adherent splinters are brought together by pressure, and cav-

ities obliterated. The same result is obtained in old fractures having no periostal callus. For other classes of fractures it is necessary to use a filling to close the focus of the fracture, so that a cavity will not be left under the sutures. For this Beck's paste, chloramine paste, and adipose graft are used. The latter is most satisfactory, since (1) "it does not require the making of a musculo-aponeurotic layer;" (2) "the graft is always obtainable in the vicinity of the zone of operation;" (3) "it will keep in place, even in cases where, owing to the lack of a sufficient quantity of cutaneous tissue, the wound has remained partially open." It is necessary to use great caution in applying adipose graft, so that no fault of asepsis may result. If sufficient skin can not be obtained to cover an old fracture, the cavity must be allowed to fill spontaneously, the application of chloramine paste preserving its sterility. (R. W. McD.)

PARKES, C. H. **Exploratory laparotomy; its use and misuse.** Surg., Gyn. and Obstet., November, 1917.

A warning note is sounded by Parkes, who deplores the use of explorative laparotomy except in extreme cases and after all other available means of diagnosis have been employed. Too often in modern surgery there are instances of hasty or unnecessary operations, some of which he cites.

1. There is the operation which is begun thoughtlessly and without intelligent diagnosis.

2. There is danger in deciding beforehand exactly what the nature of the operation shall be and proceeding on that theory without examination of the stomach itself after the abdomen is opened. It is most important that the laparotomy "be taken advantage of to determine the possibilities of operative treatment."

3. The surgeon, no matter how busy or important, should not rely on the "snap diagnosis" of others.

4. Above all, the surgeon should have a thorough knowledge of his subject and skill to proceed with the operation after a diagnosis has been established.

Attention is called to the confusion of gastric disorders with chronic appendicitis and to the difficulty, in cases of peritonitis, of distinguishing a surgical from a nonsurgical case. Intelligent preoperative treatment is urged. "It is the disgrace of the commonly understood exploratory laparotomy and kindred procedures—surgical, obstetrical, venereal, laryngological, etc.—which often prompts the layman, and frequently the doctor, to think of medicine as a fake, thus encouraging the Christian Scientist and his kind."

(R. W. McD.)

NOVITZKY, J. **Septic teeth: Their etiology and surgical treatment.** Am. Jour. Surg., August and September, 1917. **Technic for removal of dead teeth.** The Jour. California State Dental Association, November and December, 1917.

In these articles the author presents a revival of the old theory that a tooth without a vital pulp acts as a foreign body to the tissues and is a menace to the health of the tissues of the mouth and to the individual.

A pulpless tooth, or a tooth with a necrotic pulp, is a "dead" tooth and is certain to undergo putrefactive changes, because dentin contains approximately 28 per cent of organic matter subject to the laws of decomposition. Histologically, if the "protoplasmic fluid" could penetrate to or through the granular layer of Tomes, it would not be sufficient to keep up vitality in tooth dentin. The author does not concede that a pulpless tooth may be treated in such a way that it will not putrefy.

The presence of "dead" teeth, necrotic bone, such as the floor of the antrum, or carious alveolar process, may give rise to infections of the dento-alveolar joints of vital teeth, and the condition may be erroneously called pyorrhea. Such conditions have been apparently improved by the removal of such dead structures.

The term "pyorrhea," as ordinarily used, means a "traumatic, septic gingivitis, with or without detachment and infection of the pericemental fibers of a vital tooth." The gingival margin is ordinarily the location of the beginning of pyorrhea. As the result of trauma or irritation the gingiva is swollen and relaxed, allowing penetration of septic matter into the socket. From then on the process is progressive, the gingival and pericemental attachment of the tooth being destroyed. Chronic cases are insidious in their development and are usually accidentally discovered with the X-ray.

In treating pyorrhea the various factors which may induce the condition must be taken into consideration. "Salivary deposits, loss of mesiodistal tooth contact, irritation from imperfect dental work, malocclusion, loss of opposing teeth for occlusion, thickened alveolar process with impoverished blood supply, dead teeth, tonsil and upper-air passage infections, systemic cacliexia, these all influence the method of treatment." The use of intravenous or hypodermic injections of drugs or vaccines is not rational treatment.

The treatment of pyorrhea is the prompt removal of the cause of inflammation, temporary immobilization of the teeth affected, and stimulation by long, hot normal salt irrigations. "Reattachment of pericemental fibers and cemental formation with complete recovery may be expected." Where there has been much destruction of pericementum and deep infection the treatment consists of removing the tooth and other infected structures.

"Dead" teeth and teeth hopelessly affected by pyorrhea should be removed. The usual method of removing teeth by extraction has the following objections:

1. Common occurrence of fractures of the alveolar process or of the tooth itself.

2. Incomplete curettement because of the difficulty of working in the socket.

3. Retention of broken-down alveolar process and granulations due to incomplete surgery resulting in systemic toxemias.

4. The probability of failing to discover complications such as antral perforations.

5. Extensive loss of alveolar process due to a chronic, low-grade suppuration resulting from incomplete removal of necrotic structure.

Infected teeth and alveolar process should be removed by a surgical dissection. A triangular flap, with the apex at the gingival margin of the affected tooth, is raised and pulled back, exposing the outer plate of bone for a little more than the length of the root. The outer plate of the bone is removed with a chisel, exposing the cancellous bone with the root in position. The tooth and alveolar septum are removed with the chisel, leaving the inner plate of the jaw intact. This inner plate is occasionally cut away enough in the upper jaw, when the antrum is involved, to allow the inner flap of mucous membrane and periosteum to be pulled over to meet the outer and immediately sutured, when the operation is completed and the wound closed. Ordinarily it is better not to injure the inner plate, as bone regeneration appears to take place not so readily in the inner as in the outer plate when both plates are removed simultaneously.

The author's wholesale condemnation of pulpless teeth, whether their toxicity is proved or not, should be taken with some degree of conservatism.

(R. B.)

HYGIENE AND SANITATION.

FOREMAN, F. W., and GRAHAM-SMITH, G. S. **Investigations on the prevention of nuisances arising from flies and putrefactions.** Jour. Hyg., London, October, 1917.

The authors have conducted extensive experiments and investigations with the purpose of discovering easy and practicable means for mitigating the various nuisances arising from exposed animal matter and the results of their observations should be of great practical value to those likely to encounter such conditions in public health practice or in actual warfare.

In the first series of investigations it was found that attacks on the adult fly are not likely to produce appreciable effects on the numbers in succeeding generations. In order to diminish the fly nuisance, the eggs and larvæ should be destroyed in the breeding places, where they are confined as in traps. Adult flies may be killed by poisons absorbed from the alimentary canal. Aniline appears to be the most effective of these poisons, using a saturated aqueous solution plus an equal volume of sirup. They may also be killed by poisons absorbed as vapors through the respiratory tract, such as pyridine, crude naptha, and coal-tar oils.

The eggs of species likely to be dangerous to man by conveying infected material to his food, are laid on (*a*) exposed animal matter, (*b*) manure, or (*c*) refuse.

The eggs and maggots in these situations may be considered to represent large numbers of flies in traps.

For killing eggs and larvæ in their breeding places the authors found coal-tar oils, especially creosote oil, to be the most satisfactory reagents. Aniline emulsions are useful, but have little effect on putrefactive processes and the nuisances due to them.

Flies may be repelled from substances which attract them, such as decaying bodies, fecal material, and refuse, and also kept out of habitations by means of the repellant constituents of coal-tar preparations. Flies sprayed with these oils are killed.

For preventing the development of maggots in manure, the fresh manure should be sprayed "incrementally" each day at the rate of 1 gallon of creosote oil to the ton of manure. The smell which attracts the flies is diminished, most of the eggs already deposited are killed, and a large proportion of the maggots which do hatch die.

The creosote oil may be used to excellent advantage as a deodorant. It has been found of great use in removing the smell from putrefying tissues in both animal and human bodies.

It may be used in the form of a spray for destroying eggs and maggots working superficially, for deodorizing putrescent material, for repelling flies from habitations, putrefying substances, fecal matter, latrines and dustbins and for treating infected soil or fresh manure containing fly eggs.

In carcasses, true putrefaction or disintegration is preceded by: (*a*) Early gas formation, mainly due to the action of the intestinal organisms on the carbohydrates of the intestinal contents and tissues; (*b*) exudation of fluid, probably due to the effects of cytolysis and enzyme action; and, (*c*) green discoloration of the skin which appears to be connected with the effect of hydrogen-sulphide or organic acids on the blood pigments. By suitable treatment the tissues may be rendered sterile, when neither gas or green discoloration will be produced, though fluid exudes.

By true putrefaction in carcasses is meant the breaking down of the tissue constituents, accompanied by the elimination of foul-smelling products. The process is due to the activity of putrefactive bacteria assisted by the action of the tissue enzymes.

The putrefactive powers of various species of bacteria can be measured definitely by incubating an amino-acid mixture containing the organisms under standard conditions for a suitable time and determining the ratio of bases to amino-acids.

By similar means the relative powers of different disinfectants to inhibit the action of putrefactive organisms on carcasses can be compared, using for analysis the fluids which exude or tissues from comparable situations.

The proteolytic enzymes of autolysis produce small amounts of ammonia. The results of their activity, in the absence of organisms, yield to low ratio of volatile bases to the substances which respond to formyl titration. If putrefactive organisms do not develop in a treated carcass the same low ratio is obtained. The ratio is correspondingly higher the more active the organisms.

The authors believe that putrefactive bacteria mainly gain entrance into the tissues through the skin. The presence of water and a high temperature provide optimum conditions for the progress of putrefactive changes.

The burial of carcasses does not prevent the development of larvæ present in them, or the subsequent emergence of the flies.

For the superficial treatment of carcasses, reagents should be used which will adhere to greasy surfaces, form films, render the skin waterproof and kill the bacteria in it, thus checking putrefaction by preventing the access of water and putrefactive bacteria to the tissues.

Further, the reagent should be capable of eliminating any stenches which may arise, repelling flies, killing the eggs and larvæ, resisting the action of water, and remaining operative in all respects for a long period.

In the authors' experience, the reagent which possesses the required properties to the greatest extent and gives the most satisfactory results in practice, and is sufficiently cheap and easily obtained for use on a large scale, is coal-tar creosote oil.

Creosote oil mixtures may be used to great advantage for a number of purposes, and the following instructions are given by the authors for their use:

A carcass that can not be disposed of immediately should be sprinkled over with a creosote oil mixture by means of a watering can and the fluid distributed in the direction of the hair with a hand brush. The abdominal and thoracic cavities may be opened

and some of the fluid poured into them, although this does not appear to be necessary. The intestines may be punctured and some of the fluid poured in through a funnel. Small quantities should be poured into the mouth, eyes, ears, anus and any wounds there may be. One gallon usually suffices for treating a horse: half a gallon for the external treatment, and the rest for the serous cavities, if they are opened. Two men can treat a horse in 15 minutes, and this treatment will preserve the carcass for weeks.

If the fluid is injected into the carotid artery in addition to the skin treatment, the body is preserved for months.

Putrefying bodies should be sprayed from a distance. The stench will diminish, after which the body can be approached, when it should be treated thoroughly. Other foul smelling materials can be treated in the same way.

Fly larvæ can be destroyed by spraying or sprinkling the fluid over infected materials. All flies touched by the spray will be killed.

Flies should be driven out of shelters or rooms and pieces of cloth sprinkled with creosote oil mixture hung over the place where they enter. This will keep them out for several days.

For disinfecting liquids, use an alcoholic solution of the fluid.

Protective glasses should be worn by men using the spray, and the spray should not be used near an open flame. The flash point of the creosote oil in the "open cup" is 194 F.

(W. A. B.)

Bruce, J. **Treatment of scabies by sulphur fumigation.** Proc. Roy. Soc. Med., London, May, 1917.

Bruce advocates the treatment of scabies by sulphur fumigation, because it is "rapid, certain, and cheap." The cabinets used for this treatment are similar to those for Turkish baths. They are made of air-tight wood with an opening in the top for the patient's head, with a cubic capacity of 78 feet, and can hold two patients. The vapor is generated from Jeyes's sulphur candles, each candle being sufficient for the treatment of 10 patients. To encourage sweating, steam is introduced by a portable disinfector. The temperature should be from 100 to 106 F.

The patient is first given a warm bath and thoroughly scrubbed with soap. He then sits in the cabinet, with his head emerging from the opening in the roof. An orderly is in constant attendance and the patient stays in the sulphur vapor 40 or 50 minutes. A longer exposure is apt to produce dermatitis. Clothes and bedding may be fumigated in the cabinet at the same time. Relief is immediate, and encouraging reports of the treatment have been received from France.

As many as 20 men have been treated in one cabinet in one day and returned to their units cured the same day.

Various objections to Bruce's statements are made by other members, who prefer the more commonly used method of warm baths and inunctions with sulphur ointment for three days. They say that the old-fashioned treatment is more certain than the new one, as it absolutely destroys the parasites and their ova, while the vapor gives only a superficial disinfection, and the patient not only is returned for cure but may become a carrier. The prevalence of dermatitis is also mentioned.

To combat these objections, Bruce states that in a period of 18 months in the field only 2 per cent of 200 cases returned, and in that time no ointments for the treatment of scabies were given to the men.

(R. W. McD.)

Osborne, T. B., and Mendel, L. B. **The use of soy bean as food.** Jour. Biol. Chem., December, 1917.

The international shortage of food has created a demand for cheaply produced and easily obtainable sources of nutrients and has stimulated the investigation of articles not generally used as foods, but which might be found to have food value, and thus be made available in a dietary which is daily becoming more limited.

With this object in view the authors have turned their attention to the use of the soy bean as a food, and, after extensive investigations and animal experimentation, have arrived at conclusions which are interesting and suggestive.

This leguminous seed, which has long been used as a food by many inhabitants of the Far East, has been employed in this country almost solely as a suitable food for diabetics.

The employment of the soy bean for silage and as a hay crop is well known. Owing to the richness of the bean in oil, the latter is extensively expressed for commercial uses, the press cake thereby becoming available as a fertilizer or latterly as a food product.

Street and Bailey have conducted extensive investigation of the composition of many varieties of soy beans grown in this country, and also of seven commercial soy-bean "flours," prepared from the unpressed beans.

The following table shows the results of their studies:

Range of composition of soy bean products (Street and Bailey).

	Soy-bean meal.	Soy-bean flour.	
	Calculated on water-free basis.	Calculated on water-free basis.	As procured.
	Per cent.	*Per cent.*	*Per cent.*
Protein (Nx6.25)	36. 8–45. 5	43. 3–45. 0	39. 9–45. 7
Fat	14. 1–19. 0	19. 0–22. 4	18. 2–21. 4
Nitrogen-free extract	26. 2–32. 9	23. 5–27. 0	22. 4–25. 8
Fiber	4. 0– 6. 5	2. 0– 5. 7	1. 9– 5. 4
Ash	5. 2– 8. 6	4. 4– 5. 3	4. 1– 5. 1
Water	.....	.....	3. 0– 7. 8

The flours contain more protein and fat and less of all the other ingredients, owing presumably to the bolting to which they are subjected.

Recent studies in nutrition have shown the importance of supplementing our knowledge of the chemical composition of naturally occurring foods by a "physiological" investigation of the availability and suitability of the groups of nutrients which they contain. The nutrient value of natural products can not be based on the chemical analysis alone.

In testing the nutritive possibilities of various soy-bean products, the authors employed white rats in their feeding experiments.

When the question of the suitability of the protein alone was involved the other ingredients of the diet were furnished in the form of "protein-free milk," starch, butter fat, and lard. Experiments in which raw soy-bean meal was used as the source of protein in the diet showed that in the majority of cases the rats made comparatively little growth, despite the addition of the known essential ingredients other than protein. When the meal was mixed with sufficient distilled water to make a thick mush, heated on a steam bath for three hours, and subsequently dried in a current of air at 80°–90°, the resulting product fed as the sole source of protein in an otherwise suitable food, promoted growth at a normal rate. Similar results were obtained when commercial soy-meal cake was used as the source of protein.

The question then arose as to the cause of the variations in the apparent nutritive value of these different preparations. Evidently there is nothing toxic in the raw meal, for none of the rats which ate it died. The failure to grow was seemingly associated with a failure to eat the meal readily. It is probable that cooking the meal made it more palatable, thereby inducing the rats to consume more of the food, with a resulting gain in weight.

A study of the alimentary utilization of the different products was also made to see if this factor would throw any light on the differences between them. Although there is no marked difference between the utilization of the nitrogen of the raw meal and the cooked, still the nitrogen of the commercial soy cake and the cooked meal was better utilized than was the case with the raw and dry-heated meals.

The following table shows the nitrogen utilization of the variously treated meals:

Nitrogen utilization.[1]

	Per cent.
Raw soy bean meal	78.0 (76.1–79.9)
Heated soy bean meal	72.8 (70.8–75.8)
Cooked soy bean meal	82.0 (80.3–84.3)
Commercial soy cake meal	82.2 (81.1–83.6)

Having demonstrated that the proteins of the soy beans are adequate for promoting normal growth, it was important to determine to what extent the soy bean is capable of furnishing the essential vitamines and salts of the diet. On a ration consisting of soy cake meal or of cooked soy bean meal, together with an artificial salt mixture, starch, butter fat, and lard, rats have completed their normal growth, showing that the soy bean contains an adequate amount of the "water-soluble vitamine."

It appears that the soy bean contains also some of the essential fat-soluble vitamine.

The authors have also demonstrated that the soy bean is deficient in its mineral constituents, but when they added to the food 5 per cent of an artificial salt mixture there was an immediate resumption of growth.

The soy bean appears to be the only seed hitherto investigated, with the possible exception of flax and millet which contains both the water-soluble and the fat-soluble unidentified dietary essentials or vitamines. This fact, together with the high physiological value of the protein, lends a unique significance to the use of the soy bean as food. (W. A. B.)

CANTLIE, J. **Baths and bathing: British and tropical methods compared.** Jour. Trop. Med., December 15, 1917.

Writing editorially, Dr. Cantlie informs us that the much-vaunted daily cold tub, which amounts to a fetish among the better educated classes of males in Britain, does not antedate the middle of the nineteenth century. The practice of a daily morning bath was introduced into Great Britain by young men, military and civil, return-

[1] These figures represent the average results for three or four rats taken over a period of three weeks.

ing from the East and West Indies. The practice of immersion in a tub of either hot or cold water is not the bath of the Tropics, however, which is often taken in the open, and consists of emptying a bucket of hot and then of cool water over the person, followed by a rub down with a cloth. Dr. Cantlie considers this the ideal method, one which has stood the test of hundreds, nay, thousands, of years, whereas the cold tubbing of England is an experiment extending over but two generations.

Examination by the writer of a group of extremists in the matter of cold morning tubs elicited the fact that 30 per cent had albumin in the urine as a result of their bathing habits. Though doubtless the albuminuria was temporary, he regards the daily cold immersion as likely to lead in time to ill health in the form of anemia, heart irregularities, and perhaps permanent renal disturbance.

Dr. Cantlie considers an inquiry into the bathing habits of the patient an essential part of a professional examination and reverts feelingly to the warm baths taken, for the sensuous pleasure they afford, by women, who heighten the bliss of prolonged submergence with a novel and a cigarette.

The Japanese bath is recognized as differing essentially from that of other non-European nations.[1]

PATHOLOGY, BACTERIOLOGY, AND ANIMAL PARASITOLOGY.

CLOUGH, M. C. **Cultivation of tubercle baccilli from circulating blood in miliary tuberculosis.** Bull. Johns Hopkins Hosp., December, 1917.

In a review of the literature it was found that guinea pigs inoculated with blood from tuberculous patients in 1,508 cases gave positive results in 195 cases, or 12.9 per cent. Forty-eight of the cases were miliary tuberculosis, of which 32, or 66.6 per cent, gave positive results. Only 1 case was noted in which tubercle bacilli were cultivated from the blood.

[1] The Japanese, as is well known, bathe in water at temperatures above 120 F., and remain in for considerable periods. On coming out, a hasty cold affusion is used, and the body is then rubbed vigorously with a small wash cloth, but not with the idea of thorough drying. The Japanese go from the hot tank and the steaming bathhouse into the coldest outdoor weather, lightly clad and barelegged, without catching cold, presumably because the great heat of the bath acts like cold and contracts the superficial vessels, thus preventing chilling of the blood. By driving a large volume of blood into the internal organs, a sense of warmth and distinct stimulation is obtained. In winter the poorer members of the community combat the cold by attending the public bath three or four times a day. European residents in Japan very commonly renounce the cold tub in favor of an approximation to the Japanese practice, and the reviewer can affirm that a Japanese bath will keep one warm for three or four hours in the chilliest house. What an Englishman or an American deems a hot bath is tepid to a Japanese and justly regarded with horror as enervating, relaxing, and disposing to cold. [ED.]

The writer reports a series of three cases of miliary tuberculosis in which she cultivated tubercle bacilli from the blood. Ten to 15 cubic centimeters of blood were collected from a vein and added to an equal volume of 1½ per cent solution of sodium citrate. Part of the blood was used for inoculating guinea pigs and part added to shallow flasks of 5 per cent glycerin broth, neutral or slightly acid. After a preliminary incubation of about five weeks the contents of the flasks were centrifugalized and the sediment planted on blood-agar slants which were sealed with paraffin and incubated. In order to reduce the period of time required for cultivation a second method was successfully used in two cases, one of which gave positive results on two blood cultures and one from culture of spinal fluid. In one case culture was positive after 25 days and in another after 13 days. It was thought that the one requiring 25 days did so because a large amount of sediment had been placed on the slant and so made the detection of colonies or organisms more difficult. The second method used consisted in collecting 20 cubic centimeters of blood in citrate solution and laking the blood by addition of distilled water. Three-fourths of the sediment obtained after centrifugalizing was planted on blood-agar slants and one-fourth inoculated into a guinea pig. The five positive cases were found in a total of seven cases examined. Smears should be made from the slants before the colonies can be seen. In order to reduce the amount of sediment to be planted on slants the writer suggests the use of antiformin and is now trying that method.

(G. F. C.)

VAN SAUN, A. I. Wassermann reaction with diabetic sera. Jour. Med. Research, 1917, xxxvii, No. 2.

This article is of interest to those engaged in serological work from the fact that many observers have made the contention that diabetic sera gave nonspecific reactions with Wassermann antigens. In the performance of over 10,000 Wassermann reactions, 73 sera were obtained from patients with a known history of diabetes. The test used was the sheep-rabbit hemolytic system, with alcoholic extracts of crude beef heart and cholestrinized guinea pig heart as antigens; incubating at 8–10 C. in one series and at 37 C. in another. In only one instance out of the 73 specimens examined was a positive reaction obtained, and in this there was a positive history of syphilis; two sera were weakly positive and in one a history of chancre 26 years previously was obtained, while the other was negative. Nineteen sera were anticomplementary, which is attributed to the high fat content of the serum existing in diabetes, almost all of the sera being chylous and many of them extremely so. With the use of double serum and antigen controls the nonspecific fixations are

checked, as the anticomplementary qualities may be demonstrated in the double controls when false-positives may occur with the single serum controls.

(J. E. H.)

CHEMISTRY AND PHARMACY.

AXELRAD, S. **A substitute for lanolin and the preparation of cetylic alcohol.** Jour. Am. Pharm. Assn., January, 1918.

The question of substitutes for various materials has been one of prime importance during these war times, especially those substances and chemicals used in medicine and pharmacy. A year and a half ago the supply of wool fat was very limited and the price asked was four times more than that under normal conditions. A substitute called "Eucerin" imported from Germany was also scarce and the agency for this product had only 4 ounces left. It was claimed that "Eucerin" was made from the washings obtained in the manufacture of wool fat. The uses of lanolin are many, especially in pharmacy as a vehicle for ointments, in the preparation of bougies, suppositories, cold creams and plasters of various kinds, etc.

This investigation on a wool-fat substitute was undertaken with the idea of making a fatty composition, which would have all of the desirable properties of lanolin, such as body, tenacity, power of absorbing water readily, taking up solutions of various chemicals used in pharmacy, dry powders, etc.

Liebreich claimed that the absorbing power of wool fat was due to the cholesterin ethers it contained. Lifschuetz isolated the cholesterin ethers of Liebreich and proved that they had very little power of absorbing water. He concluded from his experiments that the absorbing power of wool fat was due to the fatty alcohols of iso- and oxycholesterols. He separated from the alkaline washings of partially saponified wool fat two saturated alcohols and one unsaturated alcohol. His experiments further proved that the more purified lanolin was, the lower was its power to absorb water, owing to the fact that during its purification the iso- and oxycholesterols were partly removed.

Unna states that "Eucerin" is a mixture of alcohols of the iso- and oxycholesterin group with petrolatum. He does not, however, give a commercial method for the preparation of these alcohols. The absorbing power of "Eucerin" is due to these alcohols, but Roemer claims that with the employment of cholesterols for ointment bases, hydrocarbons, such as mineral oil, benzol, etc., are essential, for it is due to them in combination that the absorbing property is imparted. Roemer confirms to a certain extent the work of Unna, but he also fails to give a method for the preparation of the alcohols.

Unna states that "Eucerin" has been used in skin preparations in Germany, especially in pure form for ichthyosis. According to the United States Dispensatory, nineteenth edition, page 97, experiments have been carried on in reference to the absorption of wool fat by the skin. Patschkowski and Kaspar claim that the skin readily absorbs lanolin, but Ritter and Pfeiffer in a long series of experiments were unable to verify these results. Grimm recommends cetyl alcohol for skin preparations on account of its absorption by the skin and he further states that he has found it useful in the treatment of prurigo, weeping eczema, and other skin infections.

In view of the fact that Unna and Roemer have written about the cholesterols, which are aliphatic higher alcohols, and Grimm has given a favorable report on the use of cetyl alcohol, the writer came to the conclusion that the use of this alcohol was advantageous in a substitute for wool fat.

A review of the literature failed to show any commercial method for the preparation of cetyl alcohol. There are many references as to its preparation from spermaceti by saponification with caustic potash and shaking the aqueous soap solution with petroleum ether, this being analogous to the extraction of unsaponifiable matter. Spermaceti is essentially the cetylic ester of palmitic acid. Chevreul, in 1818, isolated the alcohol by the above method. Krafft prepared this substance by the reduction of palmitic acid to the aldehyde and heating it with barium formate. He also made the alcohol by heating the palmitic aldehyde with zinc dust and acetic acid and hydrolyzing the acetate formed.

Levene made this alcohol by the reduction of ethyl palmitate with sodium and absolute alcohol. Schorlemmer distilled a dry mixture of barium oxide with sebacic acid. A method given in several textbooks for the preparation of cetyl alcohol was the saponification of spermaceti with an alcoholic potash, evaporating the alcohol, taking up the residue with water, adding calcium chloride solution to form calcium soap and extracting with suitable solvents. The above methods are useful for preparing small quantities of cetyl alcohol, but for commercial quantities these methods fall down for obvious reasons.

The method of Schorlemmer was found impracticable on account of sebacic acid not being a commercial substance. The extraction process causes a considerable loss of the solvent employed and formation of troublesome emulsions.

It has been found that cetyl alcohol distils at about 340–350 C. without decomposition and the writer's method is based upon the distillation of the calcium soap of spermaceti. Various experiments were performed with the following purposes in view: 1. Greatest yield of cetyl alcohol. 2. Cheapest process. 3. Most practical method.

Experiment I.—Spermaceti (20 gm.) was saponified with alcoholic potash, the alcohol evaporated and the residue heated in a distilling flask to 340 C.

Experiment II.—Spermaceti (20 gm.) was saponified with alcoholic potash, the alcohol evaporated and the soap dissolved in water. To the soap solution was added excess of a 10 per cent calcium chloride solution. The calcium soap was separated and dried at 100 C. and finally distilled at 340 C.

Experiment III.—The method employed was the same as in Experiment II, except that the soap solution was saturated with sodium chlorid. The soap was filtered, dried at 100° and distilled. Many minor experiments were performed by Method III, but they did not show results of such value as to warrant their description.

Experiment IV.—Twenty grams of calcium oxide containing about 5 per cent water were added to 15 grams of melted spermaceti. The mixture was heated for about six hours, with occasional stirring. When cooled, the mass assumed a brownish-yellow color. On distilling same, frothing occurred at 100 C., due to the escape of water. When the water had all been driven off the temperature was raised to 340° when the cetyl alcohol distilled as white fumes and on cooling formed oily drops, which became pure white upon solidification, the melting point being 49.5 C. The yield obtained was over 6 grams. This being over 40 per cent of the actual spermaceti taken. The theoretical yield (calculated) was about 45 per cent.

This method gave a larger yield than the other three preceding methods, and, calculating the cost of the alcohol obtained on a 40 per cent basis, was also cheaper in this method. The ideal temperature for the distillation of cetyl alcohol is 330°–350°, as above this temperature a yellow liquid distils, being strongly acid and having a pungent odor; its value commercially will be investigated at a later date.

A copper still, manufactured by Sargent & Co., Chicago, for the distillation of oils, etc., at high temperatures, was found to be of most service. Glass stills are apt to crack, due to the "caking" of the residue which can readily be removed from the copper still, after each distillation.

Mixtures were made having different quantities of base, cetyl alcohol, lanolin, and water. The formula finally selected as being the best suitable for pharmaceutical compounding was the following: 70 parts petrolatum, 20 parts paraffin (melting point about 60 C.), 10 parts cetyl alcohol, 5 parts lanolin (anhydrous), 100 parts water. This preparation stood in the laboratory for 17 months with absolutely no change in appearance or working qualities. The properties of this mixture are the same as wool fat—that is, taking up solutions of salts, powders, etc., etc. The advantage over wool fat is that it

will not become rancid and is considerably cheaper. The reason for using five parts of lanolin in the mixture was to have the "unctuous" property of wool fat. This, however, is a minor physical property.

EYE, EAR, NOSE AND THROAT.

TOROK, E. **The treatment of the detachment of the retina with special reference to Müller's resection of the sclera.** Arch. Ophth., Vol. XLVI, No. 5.

The treatment of detachment of the retina by present operative procedure is very unsatisfactory. Certain cases are reported where reattachment took place spontaneously, so that treatment would seem to be of still less value. Treatment is mostly symptomatic, because the etiology is still unknown and none of the various theories are universally accepted. In general, from a practical standpoint, the cases can be classified in two groups, one where there is a disproportion between the contents of the eyeball and its coat, and another where this disproportion does not exist. In the former group belong those whose cause lies in the shrinking of the vitreous, as detachment following iridocyclitis, iridochoroiditis, or intra-ocular hemorrhage, and also those cases where the extension of the sclera with or without shrinking of the vitreous is the underlying cause, as in high myopia. In the second group, where there is no disproportion between the contents and the coats of the globe, belong those cases where the detachment is due to a choroidal exudate, hemorrhage, tubercle, tumor or transudate, as, for instance, in Bright's disease or detachment, following a blow on head or eye.

The prognosis, as well as treatment, depends wholly on the cause. The cases belonging to the latter group either heal spontaneously or can be expected to improve with treatment. The group where there is a disproportion between the contents and the coats of the globe is the one whose prognosis is least favorable. The greater proportion of these detachments are due to high myopia. Medicinal treatment is of no avail. Many operative procedures are recommended. Kittel, in 1860, advised paracentesis of the sclera, and it is still the method most in favor with the majority of ophthalmologists. There are various modifications of this procedure. De-Wecker uses the electrocautery. Parinaud and Higgers employ the trephine. Some ophthalmologists try to produce reattachment by producing inflammation between the retina and choroid. Deutschmann described the method of injecting fluid in the vitreous, realizing that to cure myopic detachment we have to endeavor to equalize the disproportion between the contents and the globe. The numerous objections to this method have prevented his having many followers.

L. Müller endeavors to relieve the existing disproportion by excising a piece of the sclera, thereby diminishing the size of the eyeball. According to his theory the detachment in high myopia is due to the stretching of the choroid with atrophy and circulatory disturbances, followed by a transudate. He attributes the beneficial effect of his operation not to diminishing the size of the eyeball, but to relieving the tension of the choroid, thereby improving the blood circulation and removing the cause for a transudate to form between the choroid and the retina.

(G. B. T.)

COHEN, H. B. **The lingual tonsil and its neglect.** Laryngoscope, Vol. XXVII, No. 9.

Anatomically the lingual tonsil is situated antero-posteriorly from the circumvallate papillæ to the epiglottis on the base of the tongue, projecting backward so that when the structure is enlarged it may touch the tip of the epiglottis. On either side the tonsil is in close proximity to the inferior poles of the faucial tonsils. It consists of lymphoid nodules commonly arranged in groups of three. Its arterial supply is from the dorsal lingual branch of the lingual artery. The veins are a part of the plexus draining the tongue. Physiologically being similar in structure, it must be assumed to have a similar function to the faucial tonsil. Varicosities of the dilated veins and hypertrophy of the lymph structures are two conditions most commonly met. The symptoms most often complained of are cough, sensation of foreign body, paresthesia, voice changes, hemorrhage, and respiratory distress. The neurotic element is demonstrated in these cases. The condition is more frequently found in males than females. Treatment in general consists of the removal of irritating substances and abstinence from alcohol and tobacco. Locally, astringents, silver nitrate, menthol, glycerotannin are indicated. After prolonged local treatment with no improvement operative interference should be considered. The galvano-cautery, in cases of varix, and the lingual tonsillotome in those with plain hypertrophy, give the best results.

(G. B. T.)

STAUFFER, N. P. **Tubercular conditions of the ear, nose, and throat.** Pennsylvania Med. Jour., Vol. XX, No. 12.

Primary tuberculosis of the ear is rare; secondary tuberculosis of the middle ear is fairly common, is characterized by a painless onset and usually runs its course without any inflammatory phenomena. The discharge is usually thin and fetid. Tuberculosis, as a rule, causes rapid caseation of the glands under the ears, though many cases occur without any glandular involvement.

Tuberculosis of the nose occurs in the cartilaginous septum, as an indented swollen-edged ulcer with a dirty, rough base. In the posterior nares the ulcer is often crater like. In involvement of the pharynx the posterior wall usually shows an infiltrating and caseating follicle.

Tuberculosis of the larynx is usually secondary to that of the lungs. The primary lesion may heal, but the secondary ulcerated area may persist. The prognosis in laryngeal tuberculosis is grave. In the incurable stage injections of 1 per cent cocain solution, or 85 per cent alcohol, into the superior laryngeal area gave great relief. Amputation of the epiglottis, when it is markedly involved and is the cause of dysphagia, is an easy and painless operation if it is previously painted with 20 per cent cocain solution. A biting instrument is preferable to a snare. (G. B. T.)

MILITARY, LEGAL AND INDUSTRIAL.

Camp and Trench Sanitation.

In preventing transmissible diseases among soldiers in camps Huntington (New York Med. Jour., June 17, 1916) describes the general problems involved as (1) the disposal of human excreta; (2) the disposal of other organic, solid and liquid, wastes; (3) the furnishing of a safe water supply; (4) furnishing of an uncontaminated food supply; and (5) the proper drainage of the camp site. That these problems become more complex in actual warfare, especially in trench warfare, is obvious. Likewise new problems arise that have to be dealt with, such as the prevention and extermination of vermin, the disposal of the dead, etc.

To be successful in its aim any hygienic program must be complete in all details, and this involves the through instruction of the individual soldier. As Seaman (Wisconsin Med. Jour., June, 1917) points out personal hygiene for soldiers differs from that of civilians only in the peculiar conditions under which the former live and work. The soldier must be taught to understand the importance of fresh air at all times, that it must not be excluded from his quarters, and that it is necessary to his continued good health. He must be given not only the exercise necessary for his physical development and suitable recreation, but he should know that exercise bears a direct relation to health. Cleanliness of person, clothing, and bedding must become a habit. He must be taught the relation that infected waters bear to disease, and that he must not drink water from an unknown or suspicious supply. He should be taught proper methods of eating and should know the evils of overeating. He should eat none but good food and eat only with clean hands. He

must avoid and destroy all vermin—lice, fleas, ticks, flies, mosquitoes, roaches, rats, etc.

Water supply.—The water supply of a camp should, whenever possible, be arranged for in advance by sinking driven wells and piping the water to the necessary points, restricting the number of faucets as much as possible to prevent waste. In the Canadian military camp No. 2, in Simcoe County, Ontario, the water, according to McCullough (Pub. Health Jour., October, 1916), is pumped from six artesian wells into two 100,000-gallon tanks placed at an elevation of 130 feet above the camp level, thus providing an adequate pressure.

Water purification.—In temporary camps where surface water is used, or where troops are on the march, the problem of the sterilization of water arises. Simplest and most efficacious is boiling, and this is used in all temporary encampments. It has often been found best in Europe to make the water into weak tea, which is a better thirst quencher and more palatable than boiled water. (Saville in Am. Jour. Pub. Health, June, 1917; Abstracts of the two most important European works of the war on sanitation: Lelean's "Sanitation in War"; and Tournade, "La Pratique de L'Hygiène en Campagne.") On the march the British practice is to boil the water in kettles during the night. The water bottles are at once filled with the boiling water and thus sterilized. A second boiling provides enough for the water carts. An apparatus similar to the Forbes-Waterhouse sterilizer in use in the United States Army—a distillation apparatus so arranged that the sterilized water imparts some of the heat to the raw incoming water—has been used by the British but has been found unreliable, since the middle compartment may leak and raw water get into the outgoing stream without detection.

Filtration methods such as are applied in the Darnall apparatus of the United States Army have only a very limited use, and results with them have not been satisfactory. Most useful have been found the *chemical methods of purification.* (Saville; loc. cit.)

Hypochlorite of lime.—To secure adequate sterilization there should be one part of available chlorine to a million of water. A safe amount is 2 grams per 100 gallons.

The use of potassium permanganate alone is unsatisfactory; its effect on other than cholera organisms is too uncertain, and in addition it imparts color and taste.

The best combination of chemicals has been alum for clarification and hypochlorite for subsequent sterilization. A heaping teaspoonful of potash alum and one-third as much sodium bicarbonate suffice for the treatment of 100 gallons of water.

Sodium bisulphate provides a most useful means of sterilization of water by the use of a single tablet, and the substance is in considerable use in the British Army. It is especially useful for cavalry and such troops as occasionally find themselves away from their water carts. Each man carries a bottle of the tablets, and when refilling his water bottle he should add a couple of tablets and abstain from drinking for half an hour. Two grams of salt are allowed to the contents of an English water bottle, there being in such a dilution 0.07 per cent of free sulphuric acid, or enough to kill bacteria in half an hour. The tablets are made up with oil of lemon and saccharin, so that the solution tastes like lemonade. The objection to the method is the liability to formation of soluble sulphates of toxic metals from water bottles; aluminum water bottles should be supplied to all men using these tablets, as the amount of aluminum sulphate formed is so slight as to be negligible.

Dakin and Dunham (Brit. Med. Jour., May 26, 1917) describe a tablet of 0.1 gram weight, consisting of 4 per cent sulphondichloraminobenzoic acid, 4 per cent sodium bicarbonate, and 92 per cent sodium chloride for water sterilization. One tablet is sufficient for 1 liter of water. A concentration of 1:300,000 will sterilize an ordinarily heavily contaminated water. The solution has a very slight taste, but is quite potable.

At the meeting of the Association Générale des Hygiénistes et Techniciens Municipaux Gaultier, M. L. (Jour. Am. Med. Assn., July 17, 1915, war letter, Paris), recommended the filtration of water and its sterilization by ultra-violet rays as a method applicable to campaign use.

The sterilization centers comprise (1) a motor engine, (2) a set of rapid filters, and (3) a group of sterilizers. The motor runs a pump capable of delivering a volume of 5 to 20 cubic meters of water to be sterilized per hour, and a continuous current dynamo of 110 volts, capable of furnishing a current to the burner of the ultra-violet-ray sterilizer. According to the size of the station there are two, three, or four sand filters, an artificial sand weighing only 500 kilos per cubic meter being used. The sterilizer is composed of an enameled sheet-iron vat containing two, three, or four quartz mercury vapor lamps. The arrangement is such that the water is subjected to the influence of the lamps three times before passing from the apparatus.

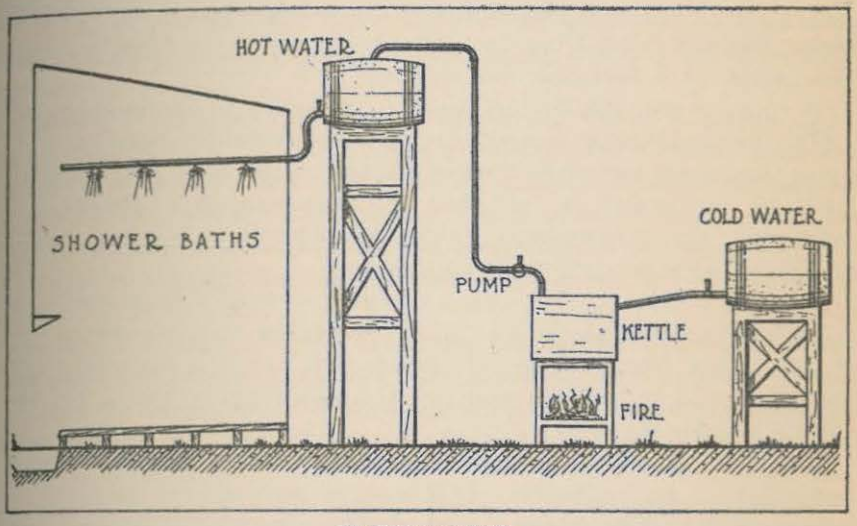
When water is taken from a stream—water for drinking, cooking, watering animals, washing, bathing—it is to be taken in the order named from upstream down.

Bathing facilities, especially shower baths, are most important, and various elaborate arrangements are provided in permanent camps. Saville (loc. cit.) describes a unique arrangement that has

been provided for the vicinity of the trenches and is considerably used. The figure is self-explanatory.

Food supply.—Cook tents and mess tents should be screened and wire gauze covers be provided to protect food from flies. Civilians should not be allowed to set up stands for the sale of food or drink within or near camp, as their wares are usually of the poorest quality and their methods the dirtiest. (Huntington, loc. cit.)

Disposal of sewage, refuse, and excreta.—McCullough (loc. cit.) describes the methods used in a large permanent Canadian camp in Simcoe, Ontario. Sewage and other liquid waste are taken care of as follows: Each battalion has 5 per cent of flush closets of the



Field shower bath.

"range" type placed in stucco-covered buildings. There is likewise a full complement of showers for the officers and men, separate latrine and shower buildings being supplied each unit. Drainage is into sewers, deeply laid. The sewers are of 12-inch, 15-inch, and 18-inch tile. Kitchen liquid waste is all passed into similar sewers, each kitchen being supplied with a screened concrete saucer into which garbage liquids are drained. The sewers are in turn connected with a large sedimentation tank where the effluent is chlorinated.

Solid noncombustible waste material, such as tin cans, bottles, wire, etc., are removed some distance from the camp, sprayed with oil, and burned over at intervals.

Remnants of food, paper, etc., are destroyed in a "Reid" incinerator—a metal box about 4 feet in each diameter and lined with fire brick.

(In this same Canadian camp all blankets are sterilized at intervals of two weeks, facilities being provided for doing the blankets of two battalions per day. Blankets are subjected to live steam for 20 minutes and then to dry heat for 5 minutes. No common drinking cups are used. Dishes and kitchen utensils used in common are boiled after using.)

The methods of disposal of refuse now used in the United States Army are described by Phalen. (Am. Jour. Pub. Health, May, 1917.)

For kitchen refuse an incinerator is constructed as follows: A quadrangular excavation 6 feet by 3 feet and preferably as much as 4 feet deep is made in the ground. This is filled loosely with large stones, broken bricks, and other materials which will conserve heat. The dirt taken from the pit is banked along the sides to about the height of a foot and this sloping bank is paved with stones. The ends of the pit are not banked, in order to increase draft. Upon this incinerator a wood fire is kept constantly burning and upon the heated stones is dumped all the refuse from the kitchen. Such an incinerator is furnished for each company. Refuse remaining in the incinerator is dumped at intervals on a refuse dump established at some distance from the camp.

Huntington (loc. cit.) suggests a modification of this incinerator. A circular pit is used, the four quadrants being used on succeeding days to allow for cleaning. He points out that it is essential that the fire should be very hot and the stones thoroughly heated before adding organic material.

Manure disposal.—The collection of manure from the stables should be continuous during the day. If it is not possible to have the manure hauled off to near-by farms, a method of burning it must be used. A dump is marked off and the manure dumped in winnows running across the area, the winnows being made by dumping the manure from the tail of the wagon as it is gradually moved across the dumping area. The windward side of the winnows is then sprinkled with crude oil and set afire.

For disposal of dead animals.—A hole about 15 feet wide by 10 feet long with a depth of 4 feet is sufficient. Wood is piled around and on top of the bodies and a couple of buckets of crude oil poured over them and set afire.

Disposal of human excreta.—A sewerage system is best if possible. Excreta incinerators have been tried but have not proved successful. The deep latrine has been used with good results. Simply stated, this is only a deep pit with a fly-tight box, with proper care given to its maintenance. The pit is usually about 8 feet deep, 18 inches to 2 feet wide, and should be 18 to 20 feet long for a company, and constructed with eight holes. It is essential that the structure be fly-

tight. The holes should be tightly covered, and furnished with a rail, so set that the cover could not remain open when the hole is not occupied. The box must be removed daily for "burning" of the pit. The latrine should not only be inclosed at the sides but it should be well roofed. This adds much to the comfort of the occupants and prevents flooding and caving in of the pit during heavy rains. Nailed to the upper angle of the inside of the box should be a piece of tin, 8 to 12 inches, shaped into a curve and so placed that it will direct urine back, so as to clear the anterior wall of the pit.

As a further protection the inclosure should be well ditched at a distance of a foot from the walls and the roof should extend sufficiently far beyond the walls to deliver rain water into the ditches.

The latrines are burned out daily by turning the box back and throwing a layer of hay or straw into the pit, which is sprinkled with crude oil and set afire. The usual allowance for this purpose is 1 gallon of oil and 14 pounds of hay per day for each latrine. The object in burning out the pit is to produce a charred layer over the excreta to render them unattractive for flies. Probably fly larvae near the surface are also killed. The interior of the pit may be sprayed daily with a suspension of lampblack in coal oil. This can be applied through the hole without removing the box. The method is said to be efficient.

For the disposal of night urine, two galvanized cans, whitewashed to make them more conspicuous, are placed in each company street. The contents of these cans are emptied each morning into the latrine pit and the cans burned out with the aid of a handful of hay and a dash of crude oil.

Montgomery (Mil. Surgeon, February, 1916) reports good results after treatment of deep latrines with a suspension of lampblack in coal oil. Before the trenches are used the top is removed from each box and the bottom and sides of the pit and the inside of the box sprayed with the mixture. The first coat is thoroughly applied. Once each day the spraying is repeated, taking care that all deposits in the trench are thoroughly covered. At the same time the seats and covers are removed, scrubbed, and sunned. According to Montgomery, the common method of burning out the pits has proved inferior to the spraying process, in that the latter is less expensive as well as more efficient. After the spraying a thin coating of kerosene and lampblack is left over the excreta, making them repellent to flies, and at the same time the interior of the trench is so dark that flies will not enter, even when the covers are off. Moreover, burning requires the removal of tents, boxes, etc., and the handling of straw and oil is troublesome and lengthy, whereas the spraying can be done by one man in 10 minutes.

Huntington (loc. cit.) suggests that a trough, thoroughly lined and leading into the pit, be provided for the disposal of urine. The can provided for night urine should be marked by a lantern. Latrines should be on the opposite side of the camp from the kitchens. Toilet paper should be provided in rolls, as when it is in separate sheets it is much more likely to be blown about.

For the use in camps of not more than four days duration is the "straddle" trench latrine. Huntington (loc. cit.) describes it as a pit not over 18 inches wide, 2 to 4 feet deep and about 10 feet long for a company. The men stand with one foot on each side of the trench, in this way avoiding the soiling of the top of the trench, and each man covers his excreta at once with a little earth. When the trench is filled to within 1 foot of the top, it is filled with dirt and marked.

At the front the problem of disposal of excreta has been a difficult and varied one; the solutions of the same have varied with local conditions. According to Saville (Am. Jour. Pub. Health, June, 1917) the French have largely used deep trench latrines, in a short trench behind and parallel to the front trench and connected with the latter by a diagonal connecting trench. The latrine is placed in the most distant part, and when filled that portion of the trench is filled level with the surrounding ground and a latrine pit dug nearer to the entrance of the trench. It is essential that latrine pits connected with trenches be always much deeper than the trench, to prevent flooding of the latter with excrement in case of heavy rains.

In Flanders, because of the frequent flooding, the English have largely discarded the trench pit. They place buckets with suitable lids in bomb-proof dugouts, buckets being removed and the contents buried by the troops leaving the front trenches for rest billets. Fresh troops going to the trenches bring the empty buckets with them.

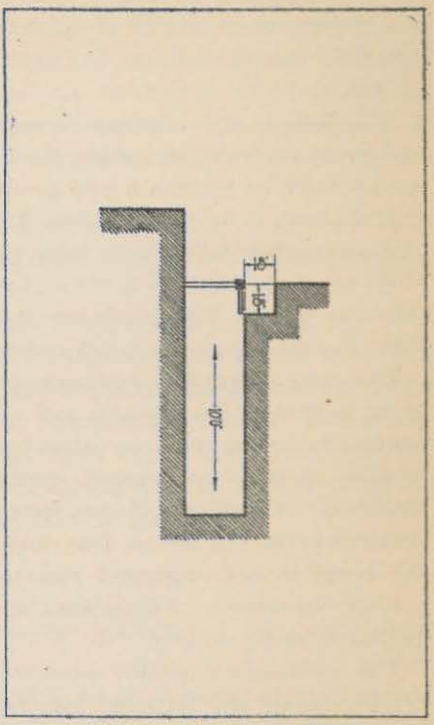
For urine the English now largely use soakage pits. The pit in the shape of a 3-foot cube is excavated and the soil at the bottom loosened. The pit is then filled nearly to the top with graded stones. When a suitable height is reached funnels are inserted in each corner at a convenient height. In this manner fouling of the surface is eliminated and the access of flies to the urine is prevented.

Saville states that "an unofficial method of disposal is said to have consisted in placing excreta in empty tins and tossing them into nearby enemy trenches. Reprisals in kind, however, were so unpleasant that the practice was abandoned by mutual consent."

At Gallipoli, according to Freemantle (Lancet, London, 1916; II. 539), shallow trench latrines were not found appropriate. They covered too much ground and not enough space was available, while the squatting position was torture to the men with diarrhea. The superficial covering of the excreta with earth was not sufficient to

keep out the flies, and maggots soon abounded. Likewise in using shallow trenches the men were constantly polluting their boots in the dark.

The choice lay, therefore, between deep trench latrines and pails. Pails involved much extra labor, the liability of soiling the hands, scattering of paper, exposure to enemy fire of the men emptying them and they were therefore abandoned.



Deep trench latrine modified.

The following modification of the deep trench latrine worked out best. The latrine pole is placed flush with the ground. The user sits level with the ground, his feet in an extra accommodation trench sunk in front of the pole to a depth of 18 inches. The latrine pit itself is 10 feet or more deep, closed on the top and at the front, separating it from the accommodation trench. The advantages are that the soldier has 18 inches more protection. Also there is only one flat plane and a single side to cover in, instead of top, back, front, and two irregular ends of the ordinary deep trench latrine. It is simple in construction and is saving of material. Disinfectants, oil, and lampblack may be used regularly. The advantages over the straddle trench are evident; no flies, paper can not be blown away, etc. When the excreta reach the level of the accommodation trench the whole pit is filled in. (R. A. K.)

HEBBLETHWAITE, A. S. **Treatment of chlorine-gas poisoning.** Jour. Roy. Army Med. Corps, London, December, 1917.

In April, 1916, the author had the opportunity of treating a number of cases of acute poisoning by chlorine gas. They came under his care 14 hours after being gassed. Weather conditions were favorable and the gases were classified as (1) mild; (2) serious.

The routine treatment for mild cases was as follows:

1. Ammonia capsule.
2. Atropine, one-fiftieth of a grain, hypodermically given.

3. Fluid or light diet for 24 hours.
4. Open air in tent during the day.
5. Ammonium carbonate mixture on the second day.
6. Evacuation to base on third day if condition admits.

Serious cases: No routine treatment can be adopted for the severe cases because the nature of one case differs from that of another. The serious cases may be divided into two groups—the "pulmonary" and the "cardiac failures." One form of treatment is not applicable to both.

The pulmonary cases are deeply cyanosed, suffer from dyspnœa and great distress, and their chests are full of râles. After the administration of ammonia and atropine, from 15 to 25 ounces of blood was abstracted by venesection. If the venesection is performed immediately after admission, these cases do well. Oxygen is beneficial if given in concentration through a rubber mouthpiece, gas-bag, and two-way valve. The administration of oxygen by means of a funnel held near the face is wasteful and does little good.

The cases of cardiac failure show pallor instead of cyanosis. The pulse is feeble, the chest is not bubbling with fluid. The cases of cardiac failure may be mistaken by the casual observer for mild cases because there is no marked respiratory distress, but, owing to the likelihood of sudden collapse, they are more serious than those of the cyanotic type. In the cardiac cases venesection does no good, because the heart is not engorged and the resistance in the lungs is not greatly increased. Stimulants are indicated, such as strychnine, digitalin, and pituitrin.

The ammonia capsules seem to stimulate respiration and lessen cyanosis, and the patients ask for them after experience of their effects. The value of the atropine is a matter of doubt. It does not have any appreciable effect upon the amount of fluid in the lungs, but it may lessen bronchial spasm.

Venesection was employed on 42 cases, all of which were serious. Of these, 12 died, and 30 were still living at the time the author prepared his report. Venesection seems to have the following effects:

1. It relieves cyanosis.
2. It relieves pulmonary congestion and makes breathing easier.
3. It relieves the acute headache which supervenes 24 hours after the poisoning.
4. It seems to promote sleep.

Ammonium carbonate and ipecac were administered separately as expectorants. These remedies seemed to do good, but the carbonate of ammonia should not be given until the beginning of the third day, as it proves too irritating.

Morphine was found of service for the relief of pleuritic pain, which begins on the third day. No local applications were at all helpful. Morphine is valuable in carefully selected cases as a means of inducing sleep, but it should not form part of a routine treatment.

In severe cases where reflex cough is abolished, postural treatment is of advantage. If the patient is conscious he should lie on his side with the foot of the bed raised about 12 inches to promote the flow of lung secretion toward the mouth, whence it can be expectorated. If the patient is unconscious, he should be placed on his back with the foot of the bed raised 24 inches. The pulmonary secretion trickles into the throat and should be swabbed out at regular intervals by a hospital attendant.

On the second day a patient's mouth is usually covered with a viscid, foul, green mucous, causing much discomfort. The condition clears up in 24 hours after repeated swabbing with hydrogen peroxide and the use of a mouth wash of glycerine and carbolic acid. Emphysema begins as a rule on the third day and causes agonizing pain. Morphine should be administered after the general condition permits. Surgical emphysema is sometimes present. Lactate of soda was used empirically on 10 patients whose cases were regarded as having about the same degree of severity. The author is unable to report definitely on the value of this medication.

ANDERSON, H. G. **Medical aspects of aeroplane accidents.** J. Roy. Nav. M. Serv., London, January, 1918.

In the early days of flying accidents were common, owing to structural defects in the aeroplanes and to inexperience on the part of the pilots. As the construction of aeroplanes was perfected there was no diminution in the number of accidents because more people entered this field. Since the war methods of teaching have been accelerated and young aviators often perform their first solo flights after only a few hours of dual-control instruction.

The author has classified accidents observed by him under two heads. Those designated "V" series represent accidents at an aeronautic station during a period of six months. The "E" series includes accidents observed during a 15 months' experience at another school.

In the "V" series, during six months, the total flying time was 4,000 hours, there were 9,000 flights, and 58 aeroplanes were wrecked or crashed; that is to say, they were so badly damaged as to require extensive rebuilding. This is in contradistinction to the effects of a bad landing or start where the damage is small and can be repaired

by the flight mechanics. Fifty-eight crashes in 9,000 flights represents 1 in every 155. There were 16 airmen injured, which is equivalent to 28 injuries in every 100 crashes, or 1 pupil injured in every 560 flights. It would, therefore, appear that school flying compares favorably in matter of safety with other high-velocity forms of transit.

Number of solo.	Number of crashes.		
	With injury to pilot.	Without injury to pilot.	Total.
First	1	8	9
Second	5	4	9
Third	1	3	4
Fourth	.....	3	3
Fifth	1	2	3
Sixth	.....	1	1
Seventh	3	5	8
Eighth	.....	1	1
Ninth	.....	2	2
Tenth	.....	1	1
Twelfth	1	1	2
After 10 hours	2	12	14
Dual control	1	.....	1
Total	15	43	58

It would appear that crashes are most frequent in the first and second solos and from the seventh solo on, because the flyer is at first inexperienced, and later overconfident and careless.

Aeroplane accidents are due to (1) defects in the machine; (2) error of judgment in flying; (3) loss of head; (4) brain fatigue; (5) fear; (6) physical illness; (7) unavoidable causes. The following table shows the frequency of these causes:

Cause.	Number of crashes.		
	With injury to pilot.	Without injury to pilot.	Total.
1. Aeroplane defect:			
(*a*) Breakage	1	.....	1
(*b*) Engine failure	.....	.....	.....
2. Error of judgment	4	38	42
3. Loss of head	6	1	7
4. Brain fatigue	3	1	4
5. Fear	.....	.....	.....
6. Physical illness	.....	.....	.....
7. Unavoidable	1	3	4
Total	15	43	58

Defects in the machine.—Defects in the machine are classified as due to: (*a*) breakage; (*b*) failure of engine. Breakage is now rare. In his three years' experience with the Royal Naval Air Service the writer has not seen a machine actually break in the air, but in one case in the "E" series an elevator control wire jammed, causing the aeroplane to nose dive with fatal results to both occupants. Engine failure may be a direct cause of accident, as when the engine fails just as the aeroplane is leaving the ground, there being no favorable landing ground or insufficient height and space to avoid obstacles in front. Engine failure may be a strong contributory cause of accidents. If the engine fails in the air, forced landing is compulsory, but if at a fair height—2,000 feet or more—the pilot can usually select a good field for landing and arrange his descent accordingly, but as he approaches the earth the pilot may find the field not so good as he anticipated when viewing it from a distance, and in such a case there is error of judgment. Such errors are more common with pupils than with experienced aviators. Engine failure just after starting is also apt to be combined with error of judgment when the pilot tries to turn back to his original starting place.

Error of judgment.—Error of judgment is the commonest cause of aeroplane accidents, both in starting from the ground, in the air, and on landing. In the "V" series error of judgment accounted for 42 out of 58 crashes, 38 being on landing. It is difficult to account for these errors of judgment. Sometimes there has been insufficient preliminary instruction. In other cases the pupil misjudges distances in spite of thorough instruction, and it may be found that his vision is below normal. On the other hand the vision may be normal, and likewise balancing power, and the error of judgment may be due to delayed reaction time, especially visual reaction time. Normal vision reaction time is from 0.19 to 0.20 of a second. It may be lengthened by fatigue, drugs and excesses, but again it is sometimes found to be slow in individuals otherwise physically fit. Hence in selecting candidates for aviation the vision and other reaction times must be up to normal standard. French medical authorities on aviation reject candidates whose reaction time is of the delayed type.

Loss of head.—This accounts for seven accidents in the "V" series. In a critical position the pupil has to think, decide, and act quickly. When he loses his head there is no mental inertia, but he makes the wrong decisions. The fraction of a second counts enormously in flying; and if a man loses his head, there is seldom time to correct an error. When a pupil in the air loses his head he may turn the throttle the wrong way, keep his engine full on when he should throttle down, or switch off his engine just when he needs all avail-

able power to make speed. The condition is allied to (1) brain fatigue; (2) fear. The sense of danger may not assert itself, but is ever present in a subconscious way.

Brain fatigue.—When suffering from brain fatigue the pupil has neither the power to reason, decide, or act. He has mental inertia, due to repeated stimuli received in rapid succession. The pupil feels alone. He makes a number of errors in succession. He feels he can not control the machine. He feels helpless, and without actual fear the enormity of the situation appalls him. He awaits the issue of events in a stupor. Questioned after an accident due to this cause, the pupil is usually found to have little recollection of what happened during the flight. Memory as well as initiative has been stunned. It is difficult to determine the type of pupil in whom brain fatigue may be expected. After it has occurred, even if the pupil has escaped injury, he usually gives up flying.

Fear.—This rarely exists in a degree sufficient to disturb flying while actually in the air, whatever sensations may be experienced before and after flight, as the mind is too much concentrated on the details of flying and the various instruments that determine speed, height, revolutions, etc.

Physical illness.—At an air station medical inspection of pilots and pupils should be held at regular intervals to determine the advent of any organic disease that might lead to loss of consciousness in the air. Flying on an empty stomach may cause faintness. Flying begins at dawn in the schools, and all pupils are provided with a good meal of cocoa, tea, bread and butter. On long flights pilots are provided with nourishment in tabloid form. Cold, fatigue, and high altitude may cause faintness or stupor. Two pupils in the "E" series suffered from attacks of malaria in the air and were made to give up flying. Another pupil in the "E" series, though slow to learn, was making fair progress, until one day he made a rather steep descent, did not attempt to flatten out, and when the machine struck the ground at its gliding angle the pilot was thrown out a distance of 66 feet, clearing the machine and escaping with only a sprained ankle. A few days later this pupil was seized with typical epileptic fits. On inquiry a history of epilepsy for five years previously was obtained.

Unavoidable causes.—Some accidents arise from unavoidable causes. In the "V" series four accidents were unavoidable, two of them being due to bad terrain with concealed obstacles and two to collision while in the air.

TYPE OF ACCIDENTS.

Accidents may be roughly classified with reference to period of flight:

Type of accident.	Number of crashes.		
	With injury to pilot.	Without injury to pilot.	Total.
1. In getting off	4	6	10
2. In the air	2	.....	2
3. In landing	9	37	46
Total	15	43	58

DRESSING STATION AT AN AIR SCHOOL.

The sick bay or first-aid station should be in full view of the aerodrome, and during flight hours a man should be constantly on duty there as lookout, supplied with field glasses. If the dressing station is not on the aerodrome, the lookout man should occupy a commanding position from which to view the flying area, and should be connected by telephone with the sick bay. A map of the aerodrome numbered in quadrants for ready reference should be kept at the sick bay. Immediately after reporting an accident the lookout man should proceed to the scene, taking the wheeled hand stretcher, on which is secured a dressing bag and an emergency tool kit, which consists of (1) two crowbars; (2) two strong wire cutters; (3) saw; (4) a long stout knife; (5) a hammer; (6) strong cloth cutting scissors; (7) a fire extinguisher.

An injured aviator should never be dragged out of a wreck except in case of fire. Cut the wreckage away from him. This may prevent a simple fracture from becoming compounded. The hospital attendant, on being notified of an accident, dispatches the ambulance to the scene, carrying two hospital attendants provided with a bag in which are the following articles:

1. Morphine solution and two Wildey's hypodermic syringes.
2. A bottle of chloroform and face mask.
3. Brandy.
4. A bottle of sterilized water.
5. Six first-aid field dressings and slings.
6. Picric-acid dressings.
7. A tourniquet, cloth-cutting scissors, and a knife.

The surgeon on duty at the aerodrome during flight hours proceeds to the spot by car or on foot, but, if the accident has taken place at a distance of a mile or more, it is better to go by aeroplane, as the writer

has done in over 30 cases. He emphasizes the advantages of having the medical attendant arrive quickly and comfortably instead of tired and out of breath. Officers and flight mechanics sent to the scene should be trained in first-aid work with special reference to aeroplane accidents. Flying pupils should not be allowed on the scene except under very exceptional circumstances.

Remove the machine from the patient and conduct a rapid examination to determine the extent of the injuries. If the patient is conscious and in pain, give morphia by hypodermic and convey him to the dressing station for completion of the treatment. If the patient is unconscious, some cutting away of clothing can be done on the field, and perhaps a dislocation can be reduced or fracture set during the unconscious period and before removal. In case of fire, unless the pilot was thrown clear of the machine, the extinguishers must be used, but they are of little value if there is any wind, as an aeroplane on fire is destroyed within a few moments. The pilot's leather clothing protects the body for a time, but the face and lower limbs rarely escape injury. As the pain from burns and other aeroplane accidents is usually severe, chloroform may be given on the field and on the way to the dressing station.

CLASSIFICATION OF INJURIES.

1. Injuries due to crushing, where some part of the pilot's body gets crushed between parts of the wrecked aeroplane. Crushing injuries are very severe in nature and mostly fatal in the propeller type of aeroplane.

2. Injuries due to collision with the ground, as when the pilot is thrown out or hits the ground with his head in turning over in and with the aeroplane.

3. Injuries due to impact with different parts of the aeroplane, as when the head is violently jerked forward and strikes the edge of the nacelle on the aeroplane's impact with the ground. Flying débris, such as broken struts and wires, may cause local impact injuries.

4. Injuries from fire.

5. Drowning and immersion effects in seaplane work.

6. Suspension effects, as when the pilot is suspended head downward in an overturned aeroplane and is unable to loosen his safety belt. In many crashes the sudden impact of the pilot's body on the safety belt causes abdominal injury.

The nature of the injuries is determined in part by the location of the engine, whether in front or behind the pilot. There has been much discussion in regard to the use of safety belts. They are valuable should the pilot faint or be wounded or encounter gusty weather or fog, preventing him from being thrown out into the air or forward against his control lever, and also preventing the feet from being jerked from the rudder bar, and so depriving him of steering power. The value of the safety belt varies somewhat with the type of machine employed. The writer advises releasing the belt near the end of a

glide before landing in the propeller type of aeroplane, but expresses no positive opinion in the case where the tractor machine is used. The ideal saftey belt should be broad and elastic and attached not to the pilot's seat but to the framework of the aeroplane.

Safety helmets are of undoubted value and should be worn by all pupils. They should set properly and not be easily dislodged. They protect from scalp wounds, but have offsetting disadvantages when the manchine turns over, as the crown of the helmet may catch in the ground, wrench the head, and cause fracture dislocation of the neck. An ideal safety helmet should take its support from the shoulders. The writer advocates the use of goggles made of non-splintering material, and there should be no metal in the composition of the nose piece.

Legal enactments against syphilis in fifteenth century. Brit. Med. Jour., December 29, 1917.

Dr. Henri Bouquet has unearthed an interesting historical document (Paris Médical, Sept. 29, 1917)—a decree of the Paris Parlement of March 16, 1496, relative to the prevention of the "great pox." It is interesting to note that the date of this decree is only four years later than the discovery of the New World by Christopher Columbus and the supposed importation of the scourge into Europe. It sets forth that for two years the disease had raged in Paris and other places in France, wherefore the reverend father in God, the Bishop of Paris, in association with certain royal officials, was commissioned to devise measures for checking the scourge. A proclamation was to be made by the public crier in the King's name that all men and women suffering from the disease who were not residents of Paris when attacked should, within 24 hours, go forth from the city to their native place or elsewhere, as they thought fit, under penalty of the hangman's rope. To facilitate their departure all such persons were to be given four *sols parisis* as they passed out by the gate of St. Denys or St. Jacques, with a strict injunction not to return till they were completely cured. Paris residents were to be confined to their houses and forbidden to go about the city under a like penalty; if they were indigent, they could on the recommendation of their parish priests or churchwardens be supplied with suitable provisions. Such poor persons as had no home to go to were to be isolated in houses hired for the purpose in St.-Germain des Préz, and were to be supplied with food and other necessaries, but were forbidden to go into the city till their cure was complete. Women were sheltered in separate quarters. When accommodation in these houses was inadequate, the patients were placed in barns and other buildings hired at the expense of the city. The patients were not allowed to hold any communication with people outside;

breach of this regulation was punished by imprisonment and corporal punishment. This ordinance could not have been very effective for on June 25, 1498, the prohibitions were reissued under the penalty of being cast into the river. This appears to be the first attempt to found special establishments for the segregation of syphilitics. It thus marks a date in the social history of venereal disease, but it may also be taken as a record of the first failure of legislative repression.

Chicago City Council's ordinance for control of venereal diseases. Bull. Soc. Hyg., New York, October, 1917.

An important ordinance relating to the control of venereal diseases was passed by the city council of Chicago, June 29, 1917.

The ordinance (*a*) declares syphilis, gonorrhea, and chancroid to be contagious, infectious, communicable, and dangerous to the public health.

(*b*) Requires physicians, managers of hospitals and dispensaries, and all other persons who give treatment for venereal diseases to mail, within three days of the first visit of the patient, to the department of health a card stating the age, sex, color, marital condition, and occupation of the diseased persons, nature, and previous duration of the disease, and the probable origin.

(*c*) Requires physicians to hand to patients afflicted with venereal disease, at the first examination, a circular of information and advice furnished by the department of health and also a copy of this ordinance.

(*d*) Requires the physician to ascertain from the patient whether a physician has been consulted heretofore, and, if so, to immediately inform the physician or person who previously treated the patient. Should the physician or person previously consulted fail to receive such notice within 10 days after the last appearance of such venereally diseased person, it shall be the duty of such physician to report to the health department the name and address of the patient.

(*e*) Requires the commissioner of health to institute such measures for the protection of others against venereally diseased persons as he is already empowered to use to prevent the spread of other contagious, infectious, or communicable diseases.

(*f*) Provides that all reports shall be confidential and inaccessible to the public.

(*g*) Holds parents of minors, having venereal disease and living with their parents, responsible for the compliance of such minors with the requirements of the ordinance.

(*h*) Imposes a fine of not less than $25 nor more than $100 for each offense on persons who violate, neglect, or refuse to comply with these provisions.

BOAZ, F. **The relation between civilization and stature.** J. Sociol. Med., Easton, Pa., December, 1917.

By civilization in this connection is understood the complexus of artificial conditions differentiating the life of man from that of the lower animals. These conditions are based on artificial preparation of food and the protection offered by clothing and shelter. The most primitive man of modern times must be considered a self-domesticated animal. All the conditions of nutrition and of shelter that are found among domesticated animals are characteristic of human life. Parallelisms between modifications in structure of skeleton of civilized man and modifications in domesticated animals have to be studied. Modifications of stature in man are to be viewed as incident to domestication. On the other hand, stature is a matter of heredity influenced by environment. Recent observations in various countries of Europe show that in the past 50 years stature has increased in every one of them. Reliable statistics obtained from Denmark demonstrate an average increase of 5 c. m. in stature.

Observations of school children in Boston for every European type show that the stature of the children of the well-to-do is in excess of that of poorer classes. This has been found true of Jewish children of London. The changes are dependent on retardation or acceleration of development. Retarded physiological maturity and low stature go hand in hand. The same is true of dentition. In children whose development is retarded in early years the retardation will probably continue. A long standing retardation can never be made up.

In retardation of growth in children, malnutrition plays an important rôle. Chronic diseases have also to be considered. As these are reduced in frequency of occurrence, many cases of retardation will disappear.

A new problem is presented by recent observations of Harvey Cushing relative to effect of internal secretions on growth.

Heredity at least for a few generations is an indisputable and marked factor.

To arrive at valuable conclusions, inquiries relative to health and nutrition of the individual and observations on stature of families are indicated. Crude observations on a large mass of individuals will not be sufficient, and statistics of the present conscription will not materially reward the student of this problem, but an intensive study of the physiology of growth might be of huge value.

WYNNE, S. W. **Longevity.** J. Sociol. Med., Easton, Pa., December, 1917.

Longevity from the viewpoint of a man or woman of middle age is usually interpreted as living to a ripe old age. But, from the view-

point of the child, longevity has a relatively different meaning and to those interested in public health this latter interpretation has appealed more strongly than the former, with the consequence that during the past decade a multitude and variety of child-welfare organizations have sprung into being. It is both proper and logical that efforts should have been focused upon the child. First, because the greatest numerical and potential waste of life was occurring during infancy and early childhood. Second, because laboratory and clinical studies had proved that the diseases of childhood were conquerable by modern sanitation and preventive medicine. Third, since a beginning had to be made the beginning of life was the logical place to commence the attack against the forces of death. On the other hand, man's greatest yearly value to the community should be during his middle lifetime, when he should be still comparatively active and when his knowledge has been ripened by experience. Therefore, efforts should not be confined to making safe only the first span of life.

Unfortunately, life tables for all communities are not available and do not extend over a sufficient period of time to permit accurate measure of the results that have been obtained in the conservation of life.

In England and Wales, during the period 1838 to 1854, the expectation of life at birth was about 40 years. Between 1910 and 1911 it was 51½ years, a gain of 11½ years. At the age of 5, in 1838, the expectation of life was 49.71 and in 1910 it was 57.14, a gain of 7½ years. At 25 years the expectation of life in 1838 was 36 years against 40 years in 1910. At 50 the expectation of life in 1838 was 19.54 as compared with 20.29 in 1910. At 70 the expectation of life in 1838 was 8.45 as against 8.53 in 1910. It is evident, then, that in England and Wales the span of life has been extended. This extension, however, has been greatest in the early stages of life, being 11 years greater at birth, only 4 years greater at the 25th year, and at 50 only 1 year; at 70 only 1 month greater.

TABLE NO. 1.—*Comparison of the expectation of life of males at certain ages in England and Wales, according to the life tables based on the mortality of 1838–1854 and 1910–1912.*

Age.	1838–1854	1910–1912	Gain.
0	39.91	51.50	11.59
5	49.71	57.14	7.43
10	47.05	53.08	6.03
15	43.18	48.57	5.39
25	36.12	40.00	3.88
35	29.40	31.71	2.31
45	22.76	23.92	1.16
55	16.45	16.89	0.44
65	10.82	10.99	0.17
75	6.49	6.49	.....

It is interesting to note that the expectation of life at 75 was exactly the same in the period 1910–1912 as in the period 1838–1854. It is only fair to state that these tables, computed as they were, many years apart, are not truly comparable because different methods were used in their construction. However, the difference in the methods used exerted but little effect upon results for the middle years of life, the only inaccuracies because of method being encountered at the extremes of life.

TABLE NO. II.

Age.	Males.			Females.		
	Life table No. 6.	Life table No. 7.	Life table No. 8.	Life table No. 6.	Life table No. 7.	Life table No. 8.
5	2,132	1,656	1,678	2,155	1,730	1,656
10	1,215	1,006	956	1,279	1,063	985
15	1,864	1,533	1,392	1,794	1,431	1,320
20	2,492	2,058	1,857	2,227	1,732	1,554
25	2,947	2,422	2,116	2,781	2,083	1,814
30	3,772	3,119	2,629	3,255	2,651	2,243
35	4,948	3,978	3,430	4,217	3,337	2,844
40	6,332	5,082	4,483	5,221	4,135	3,608
45	7,904	6,737	6,026	6,190	5,291	4,707
50	10,443	9,128	8,272	8,226	7,048	6,393
55	13,732	12,622	11,696	11,082	10,007	9,023
60	19,007	17,419	16,478	15,950	13,740	12,739
65	25,616	23,882	23,188	22,229	19,416	18,560
70	35,728	33,929	32,922	31,887	29,824	27,819
75	47,238	46,302	45,625	43,016	41,160	39,892
80	64,121	59,006	59,342	59,768	54,364	53,976
85	78,546	74,321	72,553	73 530	69,579	66,794
90	89,512	86,624	82,602	84,845	81,801	78,944

In the seventy-fifth report of the registrar general there is a table showing the number who died in five years out of 100,000 at each age according to the English life tables Nos. 6, 7, and 8, respectively. The following is quoted from the analysis of this table:

Throughout the whole life after the age of 5, life table No. 7, based on the deaths of the years 1901 to 1910, shows lighter mortality both for males and females than does life table No. 6, based upon the deaths of 1891 to 1900. Again, life table No. 8, which is of the most recent date, based upon the deaths of the three years 1910, 1911, and 1912, shows a decided improvement over No. 7. In both the tables Nos. 7 and 8 the year 1910 is included. No. 7 may be taken to show an average in mortality of the years 1905 and 1906, and No. 8 covers the year 1911, so from that point of view No. 8 is about five or six years later date than No. 7.

The following table is also given in the same report and shows the number of deaths that would take place in one year in a population represented by the actual census enumerations of 1911 according to

the rates of mortality shown by the English life tables Nos. 6, 7, and 8, respectively. At every age, as before, these tables show a reduction in the mortality according to their chronologic order. For males, age from 5 to 89 last birthday, there would be 217,199 deaths annually according to life table No. 6; 189,109 according to life table No. 7; and 175,844 according to life table No. 8. Thus annually there are 41,355 male lives saved in England and Wales by the decrease in the rate of mortality which took place between the period of 1891 to 1900 and the period 1910 to 1912. Similarly there are 48,562 female lives saved. The improvement in the rate of mortality of males has been 19 per cent; of females almost 22 per cent.

TABLE NO. III.

Ages last birthday.	Males.			Females.		
	Life table No. 6.	Life table No. 7.	Life table No. 8.	Life table No. 6.	Life table No. 7.	Life table No. 8.
5–9	8,877	6,196	6,271	8,956	6,482	6,193
10–14	4,301	3,532	3,357	4,528	3,738	3,469
15–19	6,210	5,104	4,638	6,097	4,842	4,471
20–24	7,578	6,243	5,631	7,537	5,852	5,240
25–29	8,705	7,136	6,223	9,156	6,825	5,938
30–34	10,544	8,690	7,307	9,907	8,041	6,785
35–39	12,768	10,217	8,785	11,621	9,155	7,785
40–44	13,974	11,131	9,787	12,360	9,723	8,453
45–49	15,211	12,872	11,471	12,751	10,841	9,614
50–54	16,805	14,570	13,134	14,223	12,101	10,934
55–59	17,857	16,304	15,024	15,670	14,067	12,615
60–64	19,885	18,055	16,972	18,662	15,892	14,638
65–69	21,515	19,836	19,174	22,019	18,892	17,965
70–74	20,582	19,255	18,549	23,980	22,066	20,321
75–79	15,838	15,461	15,112	19,973	18,905	18,069
80–84	11,138	9,747	9,850	15,478	13,379	13,268
85–89	5,411	4,760	4,559	8,232	7,338	6,830
Total, 5–89	217,199	189,109	175,844	221,150	188,139	172,588

It is evident, therefore, from these tables that there has been a saving of life in England and Wales at every age period from the fifth to the eighty-ninth year, and the tables printed in the seventy-fifth report of the registrar general show that there has been an increase in the expectation of life at every age up to the one hundred and fifth year, inclusive.

The German life tables show an increase in the expectation of life at every period of life from birth to the one hundredth year. At birth the gain is a little over nine years; at the fifth year the gain is five years; at the twenty-fifth year of life the gain is four years; at the fiftieth year the gain is almost two years; and at the seventieth year of life about four months.

TABLE No. IV.—*Comparison of the expectation of life for males at certain ages, according to the German life tables.*

Age.	1871-72 to 1880-1.	1901 to 1910.	Gain.
0	35.50	44.82	9.32
5	49.39	55.15	5.76
10	46.51	51.16	4.65
15	42.38	46.71	4.33
25	34.96	38.59	3.53
35	27.88	30.53	2.65
45	21.16	22.94	1.78
55	14.96	16.16	1.20
65	9.55	10.40	.85
75	5.51	5.97	.46

Unfortunately, the United States has no life tables for the entire population for an extended period of time that would permit of a comparison of the mortality and expectation of life to-day with bygone years.

However, some idea of the conservation of life in this country may be gained by comparing the expectation of life, as revealed by the life tables for the city of New York, constructed under the direction of Dr. John S. Billings, sr., and based upon the mortality of the triennium 1879 to 1881, with the life table recently constructed for the city of New York by Dr. Williams, under the direction of Dr. Guilfoy. The comparison of these tables shows that the expectation of life of a child under 5 years of age was 41 years, according to Dr. Billings's table, and 52 years according to the more recent table. This increase in the expectancy of life, however, diminishes rapidly until the fortieth year, when the expectancy of life becomes shorter, according to the recent table, than it was in 1880.

TABLE No. V.—*Approximate life tables for the city of New York, based on the mortality returns for the triennia 1879 to 1881, and 1909 to 1911.—Expectation of life for males.*

Ages.	1879-1881	1909-1911	Gain.[1]
5	49.7	50.1	+10.4
5 to 9	44.9	49.4	+ 4.5
10 to 14	42.4	45.2	+ 2.8
15 to 19	38.2	40.8	+ 2.6
25 to 29	31.2	32.7	+ 1.5
35 to 39	25.3	25.4	+ .1
45 to 49	19.8	18.9	− .9
55 to 59	14.5	13.2	− 1.3
65 to 69	9.9	8.8	− 1.1
75 to 79	7.1	5.3	− 1.8

[1] Increase +; decrease −.

The reason for this increase in mortality and decrease in the expectation of life in the later age groups has been in dispute for some time. It has been held by many that the increased mortality has been due to the more strenuous life led by the people of to-day as compared with those of a generation ago, and that it has been confined almost entirely to the so-called degenerative diseases. A table constructed several years ago by Dr. Guilfoy showed this supposition to be fallacious, and Dr. Dublin has recently published a paper in which he points out that the increase in the mortality of the degenerative diseases is apparent and not real and is due to more exact statements of causes of death by attending physicians, as well as to increased accuracy in diagnosis. He also shows that the introduction into our population of large numbers of persons of foreign race stocks, whose mortality at the later years is higher than the mortality of the natives at the same ages has been responsible for the decrease in the expectation of life after 40 years of age.

As a result of the evidence thus examined, it may be concluded that civilization has increased longevity, not only from the viewpoint of the child but also from the viewpoint of the adult man and woman, and it would seem that this increase in longevity from the viewpoint of the adult will be further advanced within the next decade or two for the following reasons: First, the incidence and mortality of the acute infectious diseases have been reduced, and since every disease that a person passes through weakens the vitality and the resistance of the individual, it is reasonable to suppose that with the reduction in the incidence of these diseases there will in later years be a corresponding reduction in the diseases that these acute infections predispose to as the children of to-day who have escaped the scars of battle with these diseases reach the later stages of life's journey. Secondly, within recent years attention has been more accurately focused upon the mortality of advanced life. Such men as Metchnikoff have pointed out that the natural life of man should be extended to 100 years and within the past year or two organizations have sprung into being which have for their object the reduction of the mortality of the degenerative diseases.

PRINCIPAL CAUSES OF DEATH DERIVED FROM CENSUS BUREAU'S SUMMARY OF MORTALITY STATISTICS FOR 1916.

The "registration area," which contained approximately 70 per cent of the population of the entire United States, reported for that year 1,001,921 deaths. Of these deaths, nearly one-third were due to three causes—heart diseases, tuberculosis, and pneumonia—and nearly another third were charged to the following nine causes: Bright's

disease and nephritis, cancer, apoplexy, diarrhea and enteritis, influenza, arterial diseases, diabetes, diphtheria, and typhoid fever.

The deaths from heart diseases (organic diseases of the heart and endocarditis) in the registration area in 1916 numbered 114,171, or 159.4 per 100,000 population. The death rate from this cause shows a marked increase as compared with 1900 (the earliest year for which the annual mortality statistics were published), when it was only 123.1 per 100,000. The increase has not been continuous, however, the rate having fluctuated from year to year.

Tuberculosis in its various forms caused 101,396 deaths in 1916, of which 88,666 were due to tuberculosis of the lungs. Because of progress in the prevention and treatment of tuberculosis of all kinds, the decline in the tuberculosis death rate in recent years has been most pronounced, having fallen from 200.7 per 100,000 in 1904 to 141.6 in 1916, a decrease of nearly 30 per cent. Before 1904 the rate had fluctuated, starting at 201.9 in 1900. Even yet, however, tuberculosis causes more deaths annually than any other malady, except heart diseases, and about 37 per cent more than all external causes—accidents, homicides, and suicides—combined.

Pneumonia (including broncho-pneumonia) was responsible for 98,334 deaths in the registration area in 1916, or 137.3 per 100,000. This rate, although lower than that for any year from 1900 to 1910, inclusive, with the single exception of 1908, is higher than that for any of the years from 1911 to 1915, inclusive. The lowest recorded rate for all forms of pneumonia was 127 per 100,000 in 1914. The mortality from this disease, like that from tuberculosis, has shown a marked decline since 1900, when it was 180.5 per 100,000. Its fluctuations from year to year, however, have been pronounced, whereas the decline in the rate for tuberculosis has been nearly continuous.

The only remaining death rate higher than 100 per 100,000 in 1916 was that for Bright's disease and acute nephritis, 105.2. The total number of deaths due to these maladies in 1916 was 75,316; of this number, 69,395 were caused by Bright's disease and 5,921 by acute nephritis. The mortality rate from these two causes has increased from 89 per 100,000 in 1900, with some fluctuations from year to year.

Cancer and other malignant tumors caused 58,600 deaths in 1916. Of these, 22,480, or nearly 39 per cent, resulted from cancers of the stomach and liver. The death rate from cancer has risen from 63 per 100,000 in 1900 to 81.8 in 1916. The increase has been almost continuous, there having been but two years, 1906 and 1911, which showed a decline as compared with the year immediately preceding. It is possible that at least a part of this increase is due to more correct diagnoses and to greater care on the part of physicians in making reports to registration officials.

Apoplexy was the cause of 58,233 deaths, or 81.3 per 100,000. The rate from this disease increased gradually, with occasional slight declines, from 1900 to 1912, and since 1913 the increase has been continuous.

Diarrhea and enteritis caused 56,763 deaths in 1916, or 79.3 per 100,000. The rate from these diseases has fallen somewhat in recent years, having been 90.2 in 1913, and is very much lower than the corresponding rate for 1900, which was 133.2. Nearly five-sixths of the total number of deaths charged to these causes in 1916 were of infants under 2 years of age.

Influenza was responsible for no fewer than 18,886 deaths in the registration area in 1916, or 26.4 per 100,000. The rate from this malady, which fluctuates very considerably from year to year, was higher in 1916 than in any preceding year since and including 1900, with the single exception of 1901, when it stood at 32.2.

Arterial diseases of various kinds—atheroma, aneurism, etc.—were the cause of 17,115 deaths in 1916, or 23.9 per 100,000. This rate, although somewhat lower than the corresponding ones for 1912 and 1913, is higher than those for 1914 and 1915. The rate for these causes increased continuously from 6.1 in 1900 to 25.6 in 1912.

Deaths from diabetes numbered 12,199, or 17 per 100,000. The rate from this disease has risen almost continuously from year to year since 1900, when it was 9.7.

No epidemic disease, with the exception of influenza, produced a death rate as high as even 15 per 100,000 in 1916. The fatal cases of diphtheria and croup—which are classed together in the statistics, but practically all of which are cases of diphtheria—numbered 10,367, or 14.5 per 100,000 population. The rate for diphtheria and croup in 1900 was 43.3, and the decline of nearly 67 per cent from that year to 1916 is relatively greater than that shown by any other important cause of death. The rate fluctuated somewhat from 1900 to 1913, but has fallen continuously since the latter year.

The mortality rate from typhoid fever has shown a most remarkable and highly gratifying decline since 1900, having dropped from 35.9 per 100,000 in that year to 13.3 in 1916. The proportional decrease in the rate, amounting to 63 per cent, is a close second to that shown for diphtheria and croup. The efficacy of the antityphoid vaccine and of the many improvements in methods of sanitation has been demonstrated in a striking manner by this great reduction in the typhoid death rate.

MEASLES, WHOOPING COUGH, AND SCARLET FEVER.

The principal epidemic maladies of childhood—measles, whooping cough, and scarlet fever—were together responsible for 17,586 deaths of both adults and children, or 24.6 per 100,000, in the registration

area in 1916, the rates for the three diseases separately being 11.1, 10.2, and 3.3. As in 1913, measles caused a higher mortality than either of the other diseases, but in 1914 and 1915 whooping cough had first place. In every year since and including 1910, as well as in several preceding years, measles has caused a greater number of deaths than scarlet fever. The rate for scarlet fever in 1916 was the lowest on record, while that for whooping cough, although considerably below the highest recorded rate for that disease, 15.8 in 1903, was far above the lowest, 6.5 in 1904.

ACUTE POLIOMYELITIS.

Acute anterior poliomyelitis, commonly called infantile paralysis, caused 7,130 deaths in 1916, representing a rate of 10 per 100,000 population. This disease developed in epidemic form in that year, and the resultant mortality showed an enormous increase. The rate from infantile paralysis declined from 2.7 per 100,000 in 1910—the first year in which this malady was reported separately as a cause of death—to 1 per 100,000 in 1915, the decrease having been continuous from year to year except for an increase between 1911 and 1912. The rate for 1916, however, was 10 times as great as that for the preceding year.

Of the 26 States in the registration area in 1916, the 5 showing the highest rates reported 75 per cent of all the deaths from this cause. These States, with their rates, were New Jersey, 41; New York, 32.8; Connecticut, 19.2; Massachusetts, 12.5; and Maryland, 8.1. The next highest 5 rates appear for Pennsylvania, 7.8; Rhode Island, 7; New Hampshire, 5.6; Montana, 5.2; and Michigan, 4.9.

ACCIDENTS AND INJURIES.

The deaths resulting from accidents in 1916 numbered 60,071, corresponding to a rate of 83.9 per 100,000 population. This rate is considerably in excess of that for 1915 (76.3). The most marked increases appear for deaths due to railroad and to automobile accidents and for those resulting from the effects of heat.

The rate for deaths from railroad accidents in 1916 (11.3) exceeds the corresponding rates for 1914 and 1915 (10.7 and 9.9, respectively), but, with these exceptions, is the lowest one recorded since 1906, the first year for which deaths from this cause were reported separately.

Deaths from automobile accidents and injuries in 1916 totaled 5,193, or 7.3 per 100,000 population. As might be expected, in view of the enormous increase in the number of automobiles in use, the death rate due to these causes has advanced continuously since 1906—the first year for which they were reported separately—when it stood at 0.4 per 100,000 population.

Deaths resulting from street-car accidents in 1916 numbered 1,775, or 2.5 per 100,000. This rate is the same as that for 1914, but shows an increase as compared with 1915. During the past 10 years, however, there has been a material falling off in the rate for this cause.

Machinery accidents caused 1,624 deaths in 1916, or 2.3 per 100,000 population, this rate being somewhat greater than those for the preceding two years—1.9 for 1915 and 2 for 1914.

The number of deaths from mine accidents and injuries in the registration area in 1916 was 2,119, corresponding to a rate of 3 per 100,000. The deaths from these accidents for the last three years show a material decline as compared with those for the preceding 10 years.

There were 2,056 deaths in 1916 from the effects of heat, the rate being 2.9 per 100,000 population. This is the highest rate shown for this cause in the last 15 years, with the exception of that for 1911, which was 5.3.

SUICIDE.

The number of suicides reported for 1916 was 10,162, or 14.2 per 100,000. This rate is the lowest for the past 10 years.

DEATHS CAUSED BY FIREARMS.

The total number of deaths due to the use of firearms in the registration area in 1916 was 8,240, corresponding to a rate of 11.5 per 100,000. Of these deaths, 3,386 were suicidal, 3,241 were homicidal, and 1,613 were accidental. The suicidal use of firearms shows a decline as compared with 1915 and 1914; their homicidal use decreased as compared with 1914, but increased as compared with 1910, 1911, 1912, and 1915, and the rate was the same as for 1913; and the frequency of accidental deaths due to their use shows a slight decline during recent years.

REPORTS.

SANITARY NOTES FROM A MARINE TRAINING CAMP.[1]

By W. L. MANN, Passed Assistant Surgeon, United States Navy.

Health in general.—The general health of the camp continues satisfactory. Steady progress in the improvement in sanitation of the reservation and municipality is noted. Until recently all sanitary matters were personally supervised by the undersigned, but the great increase of office duties now necessitates the assignment of some of the work to an assistant.

Infectious and contagious diseases.—There have been five cases of mumps, one of chicken pox, and one case of measles in the past month. Six of the above cases were in drafts who had been present on this station only a few days, thus indicating infection prior to their arrival. One case of meningitis, in a civilian laborer, was reported. The building was fumigated, and all men occupying the same quarters were examined for meningococcus carriers; two were detected and isolated. Later a case developed in a member of the Ninth Company, Mobile Artillery Force. Five carriers were detected and isolated. A systematic examination for carriers is now under way.

Method of keeping property of the medical department.—This office requisitions for the medical, surgical, and sanitary supplies for the entire station, with the exception of sick quarters (personnel about 6,000 men). All nonexpendable supplies are issued to each of the four regimental infirmaries upon the memorandum receipt of the senior medical officer, and a duplicate card-index system is kept of the same. The expendable stores are issued weekly, upon the request of the respective senior medical officer, causing this office to act as a central supply depot for medical stores.

The four dispensaries are equipped with quartermaster property, the same being charged to the post surgeon. A card-index record of these articles is kept, similar to that for the nonexpendable medical stores.

In addition, this office acts as pay office for about 100 hospital corpsmen in making out monthly pay accounts and handles the

[1] Extract from monthly sanitary report for November, 1917, Quantico, Va.

clothing accounts, which has proved a very strenuous undertaking, as the decisions regarding the clothing of hospital apprentices serving with marines are complicated and, in some points, conflicting and confusing. A chief pay yeoman is necessary to assist in this undertaking, but the request for one has been disapproved. Practically all Bureau of Medicine and Surgery forms are also made out at the central office.

The above system tends to cause an accumulation of work at this office, but it appears to be the only satisfactory manner of dealing with the situation. The constant going and coming of the various organizations requires careful supervision of all the stores. These organizations realizing that their stay at this post is temporary and indefinite are naturally more or less uninterested in the station proper. Hence all improvements and arrangements have to be initiated by the post detachment.

It is realized that the primary functions of the permanent organization at this post is the preparation of the different organizations for overseas and expeditionary duty, and endeavor has been made to keep this foremost in mind. On the whole, the duty continues interesting and instructive, and cooperation is so satisfactory that it is believed the results obtained have fully repaid the energy expended. Affairs are now much better organized and systematized than at first with consequent reduction of administrative duties.

Post laboratory.—This is under the management of two assistant surgeons, especially instructed for their duty. At present they are working on the detection of meningococcus carriers. This laboratory is essential for satisfactory handling of sanitary problems. Some of the actual or contemplated undertakings of the laboratory are as follows:

(1) Periodic estimation of CO_2 in barracks.

(2) Examination of shallow wells in the vicinity.

(3) Examination of the milk, cold drinks, and ice-cream supply of the station.

(4) Later, the bacteriological examination of the water at the bathing beach.

Suggested devices for improvement in sanitation.—The following comprise some of a series of devices that have occurred to me during my course of duty at this station. It has been impossible, owing to multiplicity of duties, to perfect any one of them:

(A) HILLSIDE INCINERATION.

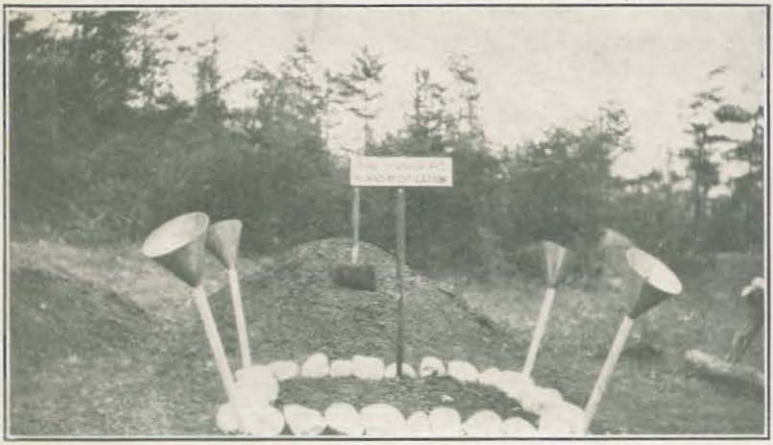
Use is made of a ravine alongside of a steep embankment. The garbage wagon drives up to the edge of the bluff and dumps the garbarge on piles of brushwood. This acts as a strainer for the solids, permitting the liquid to be collected immediately beneath the

Caldwell incinerator.

Improvised field shower bath, soakage pit and soap trap for waste water.

Bench latrine.

The Army "Leavenworth" type pit incinerator, built one-half scale.



Modified urinal soakage pit with replaceable screened tin funnels.

brush pile in small pools. The fire is then started below and gradually built upward. This arrangement has several advantages.

(1) Simplicity: One Virginia negro, in the early stages of the camp, disposed of the excremental and garbage refuse for 2,000 persons.

(2) Availability: Almost every terrain contains a hillside or a small embankment that may be utilized for this form of incineration.

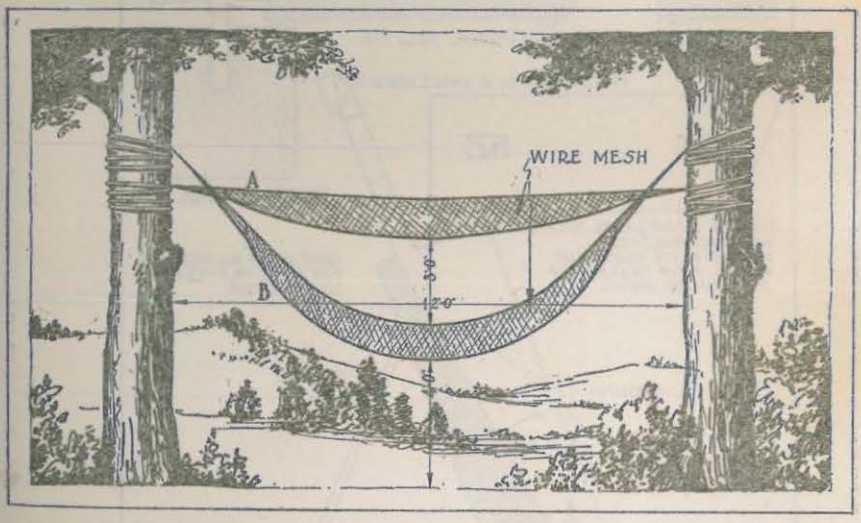
(3) Efficiency: Due to an increase of square area of evaporation and direct contact of fire with liquids, plans were under way for the development of this original idea until the receipt of Lelean's "Sanitation in War," when it was found that this author's "Inclined-Plane Incinerator" embodied the same principle and was similar in design to the plans under contemplation. A modification of the original ravine incinerator is still in use.

(B) MODIFICATION OF URINAL-SOAKAGE PIT.

This consists of the use of five-eighths inch iron piping with replaceable tin funnels, containing screening over the mouthpiece. The other specifications are the same as described in textbooks. Several of these are in use on the rifle range.

(C) MANURE INCINERATORS.

These are made of wire netting and strung by wire between trees. They can be easily improvised by the use of four iron rods and a coil of wire (or baling wire may be used). The fresh manure is placed in the upper wire hammock and a fire started in the dried manure of the lower hammock. This tends to dry out the fresh manure. Each morning the positions of hammocks "A" and "B"

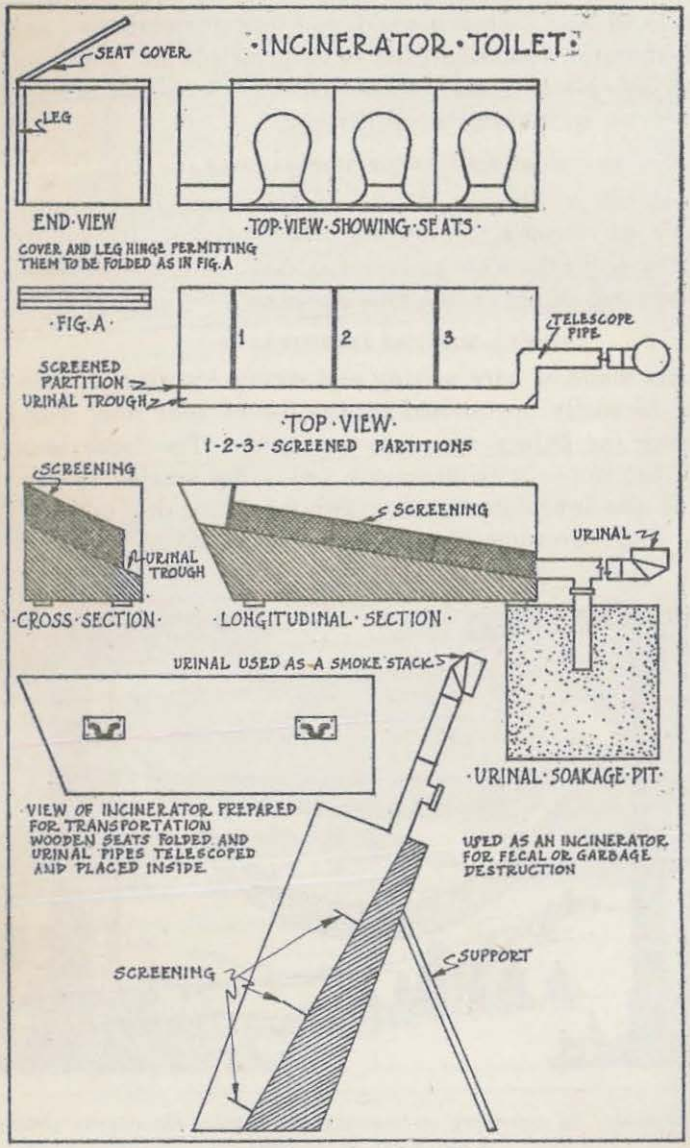


Manure incinerator. By tightening or loosening the lashings the relative positions of A and B can be changed.

are reversed and the fresh litter placed in the upper, and the fire started in the lower, and the process repeated. The value of the hammocks is in the creation of a draft. They may be swung, if necessary, to create it. The practicability of these devices is now under experimentation.

(D) COMBINED INCINERATOR, TOILET, AND GARBAGE DESTRUCTOR.

Incinerator toilets are on the market, but their weight (about 1,000 pounds) causes them to be impractical for field uses.



Scheme for incinerator toilet.

A row of latrines and urinals.

The "Lucas" and "Back to Back" modification of straddle trenches.

It appears possible to construct one similar to their design that has the "separator system" for urine and feces, permitting the urine and other liquids to be drained into soakage pits.

The solid refuse may be burnt out daily. One of these destructors will serve 100 men for excrement and garbage destruction.

Hospital Corps under instruction for expeditionary duties.—The accompanying illustrations show some of the field sanitary devices constructed by the corpsmen. The 'dugout dressing station" has been completed and equipped. A variety of latrines, incinerators, and urinals have been built in the trenches, the pictures of which were not completed in time for this report. A "shelter dressing station" is now under construction.

MOBILE LABORATORY UNITS.

By E. R. Sitt, Medical Director, and G. F. Clark, Passed Assistant Surgeon, United States Navy.

In cooperation with the Division of Sanitation of the Bureau of Medicine and Surgery, the United States Naval Medical School has equipped three laboratory units to meet the demands that may arise because of epidemics at the various training camps and stations. Two more units will be provided as promptly as possible, making a total of five units.

The units are to be based on the Naval Medical School and will be a part of the school, being merely sent to the points requiring them for such periods of time as may be necessary until the regular forces at the camp or station have sufficient opportunity to make provision for the work.

It is intended that the units shall not interfere with the usual medical work of the stations, but shall render every assistance possible in emergencies.

The personnel of each unit will depend somewhat upon the conditions to be met. For the larger camps, or during an unusual epidemic in some of the smaller ones, each unit would probably have one passed assistant surgeon, in charge; two assistant surgeons; six or more men who have had training in the preparation of media and stains, making stained preparations, blood counts and smears, plating methods, examination of urine, feces, and gastric contents, serology, and other laboratory work.

Two of the men will be required for preparation of media; two to assist in taking cultures and plating; one for urinalysis, preparation of pathological tissues for shipment, and as a general assistant. One will be used for serological work and clerical duties.

As will be noted in the list of material given below, each unit is thoroughly equipped to render all laboratory aid. Changes in the material will be made to meet special conditions of which we may learn prior to the sending of a unit.

CONTENTS OF MOBILE LABORATORY.

(WC=Working chest; SC=Supply chest; CR=Separate crate.)

Acetic acid, glacial	WC	50 c. c. glass stoppered bottle.
Agar, powdered	WC	250 gm. tin can.
	SC	Do.
Alcohol, ethyl, 95 per cent	WC	1,000 c. c. tin can.
	SC	Do.
Alcohol, ethyl, absolute	WC	500 c. c. glass stoppered bottle.
	SC	Do.
Alcohol, methyl, C. P	WC	Do.
	SC	Do.
Alcohol, denatured	WC	1,000 c. c. tin can.
	SC	Do.
Aniline gentian violet	WC	100 c. c. solution No. 1.
		100 c. c. solution No. 2.
Antigens	WC	Acetone, insoluble, 25 c. c.
		Schick test material, 100 tests.
		Cultures for agglutination:
		Typhoid—
		Para—A.
		Para—B.
		Dysentery, Shiga.
		Dysentery, Flexner.
		Cholera.
		Melitensis.
		Meningococcus, 25 cc.
		Parameningococcus, 25 cc.
Applicators, wood	WC	1 package.
Arnold, sterilizer	CR	
Azolitmin solution	WC	100 c. c. bottle.
Balances, assay or hand (AHT 21400)	WC	
Balances, Howard Trip	WC	
Beef extract, Liebig's or equivalent	WC	
Bichloride of mercury	WC	10 gm. bottle.
Bile, ox	WC	100 c. c. in nursing bottles.
Bismarck brown solution	WC	100 c. c. bottle.
Blake bottles, empty, 1,000 c. c	WC	6.
Bleaching powder	WC	1 can.
	SC	5 cans.
Blood, hemolysed-ether 10 per cent	WC	1,000 c. c.
Blood, serum-water in 8 oz. nursing bottles.		
	WC	6.
Bottles, specimen, wide mouth, 200 c. c	WC	6.
.....	SC	25.
Broth, 0.1 per cent dextrose	WC	2,000 c. c. in 8-oz. nursing bottles.
Burettes, 50 c. c	WC	1.
	SC	1.
Burners, Barthel	WC	1.
	SC	1.
Burners, Primus or equivalent	WC	1.
Carbol fuchsin	WC	50 c. c. dropping bottle.
Case of pipettes, brass	WC	1 c. c. graduate 1–100, 6.
		5 c c. graduate 1–10, 3.
		10 c. c. graduate 1–10, 2.

CONTENTS OF MOBILE LABORATORY—Continued.

Can opener	WC	1.
Capillary pipettes	WC	12 with nipples.
Centrifuge, hand	WC	1.
Centrifuge, tubes	WC	12 graduates; 24 plain.
Chloroform	WC	50 c. c. amber drop bottle.
Clamps, screw, for rubber tubing	WC	3.
Clamps, spring, for rubber tubing	WC	3.
Cork borer	WC	1 set.
Corks	WC	1 lb. assorted.
Corkscrew	WC	1.
Cover glasses, square No. 1, ½-inch	WC	1 oz.
Cylinders, glass measuring, 50 c. c.	WC	1.
	SC	1.
Dextrose, C. P., anhydrous	WC	50 gm. bottle.
	SC	250 gm. bottle.
Distilled water	WC	500 c. c. bottle.
Dropping bottles	WC	2.
	SC	4.
Evaporating dishes, 4-inch	WC	1.
	SC	1.
Fehling's Sol	WC	50 c. c. bottle copper solution; 50 c. c. bottle alkaline solution.
File, triangle, 8-inch	WC	2.
Filter paper, round	WC	50 sheets, 4-inch.
	WC	50 sheets, 12-inch.
	SC	100 sheets, 4-inch.
	SC	100 sheets, 12-inch.
Forceps, thumb	WC	2 small, 2 large.
Forceps, dissecting, 6-inch	WC	2.
Fuchsin, basic	WC	10 gms.
Funnels, glass, 2-inch	WC	2.
Funnels, enamel, 1-liter	WC	1.
Funnel stand, universal	WC	1.
Giemsa stain	WC	100 c. c. glass stoppered bottles.
	SC	100 c. c. glass stoppered bottles.
Glass tubing, soft, assorted	WC	5 lbs.
	SC	5 lbs.
Gram's iodine solution	WC	50 c. c. drop bottle.
Guaiac resin	WC	25 Gm. bottle.
Hammer, carpenter's claw	WC	1.
Hand lens, AHT 30984	WC	1.
Hemacytometer, complete, in case	WC	Red cell pipette, white cell pipette, counting chamber and cover glass, lancet.
Hemoglobinometer, Tallquist	WC	1.
Homeopathic vials, in mailing case	WC	25.
Hone, razor	WC	1.
Hone, carborundum	WC	1.
Hydrochloric acid, concentrated	WC	50 c. c. glass stoppered bottle.
Immersion oil	WC	1 oz. bottle.
	SC	1 oz. bottle.
Incubator, American Standard; with complete equipment for oil heating.	CR	1.
Inoculating needles and holders	WC	2.
Inulin	WC	10 gms.
Jars, fruit, for anaerobic cultures; 2-quart.	WC	2.
	SC	4.
Lables, bottle	WC	200.
Labels, slide	WC	200.
Lactose, bacteriological use, powered	WC	50-gm. bottle.
	SC	250-gm. bottle.
Lamp, alcohol	WC	1.
Lamp, plumber's blast, AHT 23048	WC	1.
Lead foil	WC	1 lb.

CONTENTS OF MOBILE LABORATORY—Continued.

Lens paper	WC	1 package.
Litmus paper, red and blue	WC	1 bottle each.
Mailing cases, long and short	SC	10 each.
Mannite	WC	20-gm. bottle.
Measuring cups, enamel, 1,000 c. c.	WC	1.
Methylene blue, Löffler's	WC	50 c. c. drop. bottle.
Methylene blue, powered	WC	10 gm. bottles.
Micrometer, ocular	WC	1.
Microscope, complete	WC	1.
Objective, 16 mm., 4 mm., 2 mm.; oculars, low power, medium power, with diaphragm for micrometer.		
Abbé condenser		
Mechanical stage		
Millimeter rule	WC	1.
Miner's cups, enamel, 2 qt	WC	2.
Miner's cups, enamel, 1 qt	WC	2.
Mortars, 3-inch porcelain, with pestles	WC	1.
Nails and tacks, assorted	WC	1 lb.
Needles, for syringes:		
Fine	WC	12.
Coarse	WC	12.
Spinal puncture	WC	3.
Nipples, rubber	WC	6.
Nitric acid, concentrated	WC	50 c. c. bottle.
Nursing bottles, W. T. 8 oz	WC	24.
Nutrient agar:		
2 per cent in nursing bottle for Endo	WC	6.
1.5 per cent in tubes	WC	48.
2 per cent veal infusion agar, in tubes	WC	60.
Paper pads, medium size	WC	2.
Paper, wrapping	SC	6.
Pencils, lead, medium hard	SC	20 sheets.
	WC	6.
Pencils, wax, for glass	SC	12.
	WC	4.
Peptone, Witte's or best substitute	SC	8.
	WC	1-lb. bottle.
Peroxide of hydrogen	SC	2-lb. bottle.
Petri dishes, 10 cm	WC	50 c. c. bottle.
	WC	200.
Phenol, C. P., cryst	SC	200.
Phenolphthalein	WC	250 gm.
Pitchers, enamel, 2,000 c. c	WC	25 gm.
Pliers, combination	WC	1.
Potassium iodide	WC	1.
Pyrogallic acid	WC	10-gm. bottle.
Razor	WC	250-gm. bottle.
Rubber apron	WC	1.
Rubber bands, assorted	WC	1.
Rubber gloves, autopsy	WC	1 gross.
	WC	2 pairs.
Rubber bandage	SC	2 pairs.
Rubber stoppers, assorted	WC	1.
Rubber tubing, one-fourth inch, for blood systems	WC	1 lb. solid and 1 lb. perforated.
	WC	6 feet.
Rubber tubing, one-half inch	WC	Do.
Safranin solution	WC	100 c. c.
Sauce pans, enamel, 2 qt	SC	1.
Scalpels	WC	1.
Scissors, L. & S	WC	3.
	WC	3.

CONTENTS OF MOBILE LABORATORY—Continued.

Screw hooks, brass, assorted	WC	12.
Scrubbing brushes, hand	WC	2.
	SC	4.
Serum (as may be required):		
Antipneumococcus, types 1, 2, 3	WC	1 bottle each.
Antimeningitis, polyvalent	WC	1 bottle.
Typhoid—	.....	Do.
Paratyphoid, A	.....	Do.
Paratyphoid, B	.....	Do.
Dysentery, Shiga	.....	Do.
Dysentery, Flexner	.....	Do.
Cholera	.....	Do.
Melitensis	.....	Do.
Serum, hemolytic (antihuman)	WC	2,000 units.
Slide boxes	SC	12.
Slides, microscope	WC	200.
	SC	500.
Slides, microscope, hollow ground	WC	12.
	SC.	24.
Soap, Ivory	WC	2.
	SC	12.
Soap powder	SC	10 lbs.
Sodium carbonate	WC	250 gm. bottle.
	SC	500 gm. bottle.
Sodium chloride	WC	25 gm.
	SC	500 gm.
Sodium citrate	WC	50 gm bottle.
	SC	500 gm.
Sodium hydroxide	WC	500 gm.
Sodium sulphite, anhydrous	CR	1.
Stove, oil, 3-burner, with oven	WC	1.
Sterilizer,[1] American, standard autoclav, for oil heating with primus burner.	WC	1.
Spatula	WC	1.
Stitt's Manual of Bacteriology, etc	WC	3 each.
Syringes, all glass, 2 c. c., 5 c. c., 10 c. c.	WC	1.
Tape, cotton	WC	1.
Tape measure	WC	73.
Test tubes, assorted:	SC	432.
Bacteriologic, 150 by 15 mm	WC	100.
	SC	300.
100 by 10 mm	WC	4.
Test tube brushes	WC	1.
Test tube racks, 12 tubes		4.
Test tube racks, 90 tubes, serological		
Thermometers:	WC	2.
1°–100 C	SC	2.
	WC	2.
1°–200 C	SC	3.
Toothpicks	WC	1 package.
Tr. iodine	WC	100 c. c. bottle.
Tripod	WC	1.
Twine	WC	1.
	SC	6.
Urinometer and cylinder	WC	1.
Vials, homeopathic	WC	12.
	SC	24.

[1] Dressing sterilizer, if conditions permit.

CONTENTS OF MOBILE LABORATORY—Continued.

Vise, bench	WC	1.
Weights for balances	WC	1 set.
Wire:		10
Iron, hay bale	WC	10 feet.
Copper, hay bale	WC	Do.
Wire baskets	WC	3.
	SC	6.
Wire gauze	WC	3.
Xylol	WC	50 c. c. drop. bottles.
	SC	500 c. c. bottles.

ADDITIONS.

Push pins	WC	3 packages.
Flasks, Erhlenmeyer	WC	
100 c. c		12.
250 c. c		6.
500 c. c		6.
Beakers, nest	WC	2.
Pump, filter AHT 28,000 ¾-inch	WC	1.
Note books	WC	2.
	SC	4.
Bottle for immersion oil	WC	1.
Clock	WC	1.
Graduate, 10 c. c	WC	1.
Watch glasses	WC	4.
Sponge	WC	1.

WOUNDS LIKE THOSE OF WAR OCCURRING IN CIVIL PRACTICE.

By W. M. BRUNET, Assistant Surgeon, United States Naval Reserve Force.

These few cases with detailed histories and treatment are cited with the idea that in some small measure they may prove instructive by considering first the diagnoses, next the errors of judgment that occurred in treatment, and finally those cases that were correctly treated.

CASE 1.

H. J., white, aged 42, laborer. Was shot in the abdomen with a 32-caliber revolver at a distance of 40 feet. Ball entered the abdomen about 2 inches below the umbilicus, and one-half inch to the left. Patient was taken to the hospital within one hour after being shot.

Examination.—Well-developed, muscular man, apparently suffering from shock, who thought he was dying. Face pale and covered with a cold, clammy sweat; pulse rapid, abdomen rigid, marked tenderness over the left lower quadrant.

Treatment.—When first seen tincture iodine was poured into the wound, and a sterile dressing applied. After reaching the hospital

he was treated for shock. Hot water bottles were placed in the bed, and one-quarter grain of morphine was given hypodermatically. In four hours he had reacted well, and a laparotomy was done.

Operation.—Peritoneal cavity entered through median abdominal incision. The belly wall was retracted, and the peritoneum under the superficial wound was found to be intact. Careful inspection of the viscera yielded negative results. Abdomen closed in usual manner without drainage. Patient made an uneventful recovery.

Postoperative.—After a three-weeks' stay in the hospital the patient was taken to a roentgenologist, and the bullet was located in the muscles of the left lumbar region. Patient refused to have the bullet removed. However, it has caused no symptoms since the injury, about two years ago.

Comment.—This case was an error of judgment. The patient should have been observed a longer time, and X-rayed before operation.

CASE 2.

J. P. H., white, aged 36, railroad-construction foreman. Was struck on the head with a piece of flying stone from a blast. Patient was 40 yards away from the explosion, and the stone weighed about 7 ounces. He was taken to the city three hours after receiving the injury.

Examination.—Fairly well nourished and developed man; unconscious; large laceration of scalp, with a depressed fracture over the right temporo-parietal region; unequal pupils, reacted to light and accommodation but slowly; pulse 42; respiration 10 to 12 per minute.

Operation.—Horseshoe-shaped incision over the right temporal area; flap reflected downward, revealed a compound comminuted fracture; hemorrhage profuse; upon removal of the many pieces of bone a large extradural clot was exposed; the clot was removed and the rough edges of bone smoothed off; the dura was punctured in many places by spicules of bone, and the minute hemorrhages from a number of vessels, which could not be satisfactorily stopped, necessitated the packing of the cavity; plain gauze was used as a packing.

Postoperative.—Head of bed elevated; ice cap to head; bromides per rectum for restlessness; a soapsuds enema was given, followed by saline, 1 pint every four hours. After 24 hours the mental condition cleared up rapidly, and the patient could answer questions fairly well. Gauze packing was loosened after 48 hours, and completely removed in 96 hours. After the patient was able to swallow, urotropin, 10 gr. well diluted with water was given every four hours. Convalescence uneventful. Patient went home in four weeks. He has severe headaches at times, but a saline cathartic promptly

clears up the condition. He returned to work after three months, but was blast-shy. Last heard from about six months ago—at work, and doing well.

Comment.—This case is interesting from the fact that of the head injuries seen in civil practice by me, the more severe cases do much better than the simple linear fractures. This patient received a very extensive compound fracture of the vault, which cleared up after operative interference.

CASE 3.

R. R. J., white, aged 35, traveling salesman. While dressing in his room his wife removed a revolver from the dresser drawer, and it "went off," the bullet striking him in the left side of the forehead just above a line drawn from the external canthus. He was brought to the hospital within one hour after the accident.

Examination.—Well nourished and developed man; unconscious, with a bullet wound in left side of forehead. Pupils unequal and responding very slowly to light; hemorrhage in and around both orbits.

Treatment.—When first seen the site of the wound was painted with tincture iodine and a sterile dressing applied. Hospital treatment: Bed elevated; ice cap to head; soapsuds enema, 1 pint given every 4 hours followed by saline. In 24 hours the patient was regaining consciousness. At this time a fundus examination of both eyes revealed the following: Left eye, a marked hyperemia of the optic nerve and the hemorrhagic condition of the eye interferes with a clear vision of the field. Right eye, minute hemorrhages in the fundus. After 10 days the right eye cleared up nicely; left eye blind, optic nerve destroyed. Recovery uneventful. An X-ray examination at this time revealed the bullet under the right frontal lobe of the cerebrum. Operation for removal of the bullet refused. Left the hospital in two weeks.

Comment.—This case is interesting from the course of the bullet and the damage which it produced. It severed the left optic nerve and produced a concussion of the right optic nerve, which cleared up very quickly. I am of the opinion that the reason the missile did not produce death was because of the inferior quality of the weapon and the age of the ammunition. I was told that the cartridges had been in the pistol for two years or more. The course of the bullet was across the left orbital fossa, ranging upward through the roof of the right orbit. It lodged under the right frontal lobe of the cerebrum. I could never get any information about this man after he left the hospital, and the case was not followed.

CASE 4.

H. H., negro, aged 25, laborer. In a Saturday night row over a "crap game" the patient was said to have been hit in the head with an axe and stabbed in the head with a knife. After the fight he went to his shack and did not report for work for some days, his companions reporting that he was feeling sick. After a lapse of 10 days he was seen by the camp physician, who found him with a temperature of 103 F. and a left hemiplegia. He was brought to the hospital for treatment.

Examination.—Well nourished and developed negro; temperature, 103 F.; pulse, 60; respiration, 26; blood pressure, 160 m. m.; pupils unequal. Two small scars over the right parietal region. Left hemiplegia.

Operation.—Usual horseshoe shaped incision made over right tempero-parietal region; flap reflected downward. Upon turning the flap down a small piece of metal was found embedded in the bone, flush with the contour of the vault. It was impossible to remove it with forceps. A trephine was used to remove a button of bone and the guide was placed near the piece of metal. Upon removal of the button of bone the piece of metal proved to be a broken off knife blade, which projected five-eighths of an inch into the cranial cavity. With difficulty the trephine opening was enlarged, the dura being so tense that it bulged into the opening and caused considerable trouble. The edges of the dura where they had been in contact with the metal knife blade were very black. The dura was incised freely, and a quantity of pus and disintegrated brain tissue flowed into the wound. The destruction of brain tissue was very extensive, and a cavity was left after the evacuation of pus and débris into which a lemon could have been placed. Rubber tubing was used for drainage, and sewed into the lower angle of the wound. The patient lived 10 days after the operation.

Post-mortem.—The skull cap was removed and the condition found was a Streptococcus lepto-meningitis. The cavity in the brain tissue was 3 by 4 inches, and it seemed quite remarkable that the man survived the operation as many days as he did.

Comment.—This man should have been seen earlier by a physician. He should have had an X-ray examination prior to operation. He might have been attended by the company's physician had not word been received that the patient would be at work in a day or two. No radiographer was available when the man was brought to the hospital, and with the history and the physical findings, the exploration seemed advisable.

CASE 5.

J. W., negro, aged 32, cook. Was shot in the buttocks with a .44-caliber Colt revolver at a distance of 30 feet; came to the hospital two days after being shot.

Examination.—A very large fat negro, with four gunshot wounds in buttocks. The bullet entered the right buttock, and passed through the left, only injuring the muscles of this region. Both buttocks were swollen and extremely tender.

Operation.—The wounds were incised freely, but not laid open, and a large rubber tube was used for through and through drainage.

Treatment.—The wounds were irrigated twice daily with a cherry-red iodine solution, and the dressings kept wet with the same solution. Patient left the hospital in one week.

Comment.—It might be asked why the wounds were not laid wide open. I think the incision of the gluteal muscles in the presence of such an infection as we had here would have been bad surgery.

CASE 6.

J. H., negro, aged 28, laborer. In a railroad camp brawl he was shot in the left side of the abdomen with a .38-caliber Colt revolver at a distance of 20 feet. He was seen by a physician a few hours after being shot, who applied a sterile dressing. Patient was brought to the hospital 18 hours after receiving injury.

Examination.—Fairly well nourished and developed negro, in a very serious condition; temperature 102 F., pulse 112, respiration 22 per minute. Large gunshot wound in the left side of the abdomen just below the costal margin. Abdomen tympanitic and rigid; upon removal of the dressings from the wound a fecal odor was detected.

Operation.—High median incision. Upon opening the peritoneal cavity a large quantity of blood, feces, and undigested food were found free in the abdomen. At this stage of the operation the patient died. After death the abdominal viscera were thoroughly explored. The bullet entered the left side just below the costal margin in the mid-axillary line and, passing upward and to the right, penetrated the splenic flexure of the colon, stomach, and liver, went through the diaphragm, and lodged in the right lung.

Comment.—This abdomen was opened too late. Immediate operation might have saved the patient.

CASE 6.

H. W., white, age 12. While playing with a .22-caliber rifle he accidentally pulled the trigger, and the bullet entered the abdomen just below the umbilicus. He was seen within a short while after

the accident and taken immediately to the hospital, a sterile dressing having been applied.

Examination.—Very well developed and nourished boy, with a small bullet wound below the umbilicus. Small amount of hemorrhage from wound. The little patient complained of pain in the region of the wound.

Operation.—Median incision slightly to the right. Upon opening the peritoneum a small quantity of blood and partly digested food flowed into the wound. The small intestine was found to be perforated in four places, and in one section a round worm had been cut in two by the bullet, and another worm was halfway in the lumen of the intestine and half in the abdominal cavity. Further down in the intestine a large mass of round worms was found which almost occluded the lumen of the gut. The four perforations were sutured and the line of sutures inverted. Two rubber-tube drains were placed in the wound, one at each end.

Post operative.—Bed elevated; saline introduced per rectum one-half pint every four hours. Morphine (gr. $\frac{1}{12}$) given subcutaneously every eight hours for pain. After three days the drainage tube in the upper angle of the wound was removed and the tube in the lower angle shortened to about one-half its length. On the fifth day a vermifuge was administered, and a large number of round worms were expelled. Patient was up in bed at the end of 10 days and home in 3 weeks.

Comment.—This case simply demonstrates afresh the value of early operation in all gunshot wounds of the abdomen where there is injury of the viscera.

REPORT OF CASES TREATED ON THE U. S. S. OLD COLONY DURING THE HALIFAX DISASTER.

By H. C. Petterson, Assistant Surgeon, United States Naval Reserve Force.

The U. S. S. *Old Colony* was lying in the harbor of Halifax, Nova Scotia, at the time of the terrible disaster on December 6, 1917, which resulted from the collision of two ships, one on fire and the other loaded with ammunition. Medical and surgical treatment was given to 94 sufferers, both civil and military, and patients were retained on board and treated for periods varying from 1 to 10 days. Some of the injuries were of such a trivial nature that the patients left the ship immediately after receiving first aid, during the most acute stage of the emergency and before a full record of the work done could be written up. These cases numbered 18.

Two cases remained aboard for 10 days, 21 cases for 7 days, 5 cases for 6 days, 15 cases for 5 days, 7 cases for 4 days, 6 cases for 3 days, 11 cases for 2 days, 4 cases for 1 day.

There were 4 deaths on board.

	Cases.		Cases.
Abscess of neck	1	Fracture of ribs	2
Amputation of both feet	1	Gangrene of left forearm	1
Amputation of left forearm	2	Injury to eyes	1
Bruises, cuts, and minor wounds	33	Injury to toe	1
Burns, extensive	1	Internal injuries and pneumonia	1
Burns of eyes	2	Pott's fracture	1
Dislocation of shoulder	2	Punctured wounds	1
Fracture of arm	2	Strain of right hip	1
Fracture of femur	1	Synovitis of knee	1
Fracture of leg	2	Trauma of both eyes	1
Fracture of radius	2		

Some of the cases not given in the above table were patients on ship or at hospital in Halifax before the disaster. For example there was 1 man convalescing from pneumonia, from H. M. S. ———.

BOOK NOTICES.

THE THIRD GREAT PLAGUE, by *John H. Stokes, A. B., M. D.*, Chief of the Section of Dermatology and Syphilology, Mayo Clinic, Rochester, Minn. W. B. Saunders Company, Philadelphia, Pa., 1917.

The ideal book for the physician to put in the hands of a luetic patient in order to secure his intelligent cooperation toward a cure.

IMPOTENCE AND STERILITY, by *G. Frank Lydston, M. D., C. L.* The Riverton Press, 25 East Washington Street, Chicago, Ill., 1917.

The 100 pages of this volume devoted to the subject of sex-gland implantation are of special interest.

A CLINICAL MANUAL OF MENTAL DISEASES, by *F. X. Dercum, A. M., M. D., Ph. D.* W. B. Saunders Company, Philadelphia, Pa., 1917.

MILITARY SURGERY, by *D. P. Penhallow, S. B., M. D.* Oxford University Press, London, 1916. (American branch: 35 West Thirty-second Street, New York.)

This work is based on the author's experience at the American Women's War Hospital, Paigpton, England, and on contributions to current medical literature. 151 illustrations, 400 pages.

NEUROSYPHILIS (Modern Systematic Diagnosis and Treatment), by *E. E. Southard, M. D., Sc. D., and H. C. Solomon, M. D.* W. M. Leonard, Boston, Mass., 1917.

The subject is presented in 137 case histories and based on a study of 2,000 cases of neurosyphilis and 100 autopsies. Neurosyphilis and the war occupies 100 pages.

War shock. The Psycho-Neuroses in War Psychology and Treatment, by *M. D. Eder, B. Sc., M. R. C. S., L. R. C. P.* P. Blakiston's Son & Co., Philadelphia, Pa., 1917.

Based on the first 100 consecutive cases of psychoneurosis coming under the writer's care while in charge of the psychoneurological department, Malta.

Diseases of the heart. A Clinical Treatise for the General Practitioner, by *Edward E. Cornwall, Ph. B., M. D.* Rebman Company, New York, 1917.

As the author states, this is not an exhaustive treatise. It offers a very simply written, practical clinical presentation of many features of diseases of the heart. Part II, dealing with general and special therapeutics, exercise, and diet, is particularly useful.

Blood transfusion. Hemorrhage and the Anaemias, by *B. M. Bernheim, A. B., M. D., F. A. C. G.* J. B. Lippincott Company, Philadelphia, Pa., 1917.

History of medicine, by *F. H. Garrison, A. B., M. D.*, Principal Assistant Librarian, Surgeon General's Office, Washington, D. C. W. B. Saunders Company, Philadelphia, Pa. (2d edition), 1917.

French-English military technical dictionary, by *Colonel C. De Witt Willcox, U. S. A.*, Professor of Modern Languages, United States Military Academy. Government Printing Office, Washington, D. C., 1917.

Contains a supplement giving the most recent military and technical terms.

Typhoid fever Considered as a Problem of Scientific Medicine. By *Frederick P. Gay.* Macmillan Company, New York. 1918.

The absence of an index is a serious drawback and lessens very decidedly the value of this monograph as a reference book.

Principles of hygiene. By *D. H. Bergey, A. M., M. D., Dr. P. H.* Second edition. W. B. Saunders Company, Philadelphia. 1918.

The chapter on naval hygiene is extremely meager and in no sense up to date. It is remarkable that a writer living in Philadelphia, the seat of one of our principal navy yards, should undertake to write a chapter on naval hygiene while himself so unfamiliar with the naval service, from which his figures are derived, as to use the word "marine" incorrectly. He speaks of the rigid character of the examination required "in the selection of marines," but his figures as to height, weight, vital capacity, etc., are based on examinations of candidates for the United States Naval Academy, reported by Dr. Gihon, who died as a retired medical officer 16 years ago. His figures in regard to the daily ration supplied to United States "marines" are based on an article published by Dr. Henry G. Beyer 19 years ago relative to the regular naval ration. Of this short chapter two pages are devoted to quoting obsolete regulations covering the enlistment of boys between the ages of 15 and 17 (sic). In discussing principal diseases among marines the author gives figures for the year 1899, and among these figures he gives admissions for typhoid fever, 134.

In so far as the Navy is concerned, chapter 14 may be regarded as obsolete. One would be justified in concluding from a perusal of this chapter that no advances had been made in naval hygiene, and that the author had not even considered the possibility of such advances, since he has apparently made no effort to acquaint himself with the conditions that prevail in modern navies—the Navy of his own or of other countries. If the rest of the book is on a par with this chapter, the figure "1918" on the title-page is misleading.

NOTICE TO SERVICE CONTRIBUTORS.

When contributions are typewritten, double spacing and wide margin are desirable. Fasteners which can not be removed without tearing the paper are an abomination. A large proportion of the articles submitted have an official form such as letterhead, numbered paragraphs, and needless spacing between paragraphs, all of which require correction before going to press. The BULLETIN endeavors to follow a uniform style in headings and captions, and the editor can be spared much time and trouble and unnecessary errors can be obviated if authors will follow in the above particulars the practice of recent issues. This is not only important in special articles, but still more so in reviews. For example, an article by P. A. Surg. G. Alen, U. S. N., on Removal of the Gasserian Ganglion, should be headed as follows:

Removal of the Gasserian Ganglion.

By G. Alen, Passed Assistant Surgeon, United States Navy.

If a review is submitted of an article by J. E. Thompson, M. B., B. S. (Lond.), F. R. C. S. (Eng.), F. A. C. S., Galveston, Tex., Professor of Surgery, University of Texas, entitled "A Study of Modern Operations in Hypospadias from an Anatomical and Functional Standpoint," appearing in Surgery, Gynecology, and Obstetrics, Volume XXV, No 4, October, 1917, the following heading would conform to the usage of the BULLETIN in recent years:

Thompson, J. E. Modern Operations for Hypospadias. Surg., Gynec., and Obst., October, 1917.

The author's initials are important, not so his titles. If the reviewer is not familiar with the exact abbreviation employed by the Index-Catalogue of the Surgeon General's Library and the style adopted by the American Medical Association Press, it is best to write the name of the periodical in full.

The greatest accuracy and fullness should be employed in all citations, as it has sometimes been necessary to decline articles otherwise desirable because it was impossible for the editor to understand or verify references, quotations, etc. The frequency of gross errors in orthography in many contributions is conclusive evidence that authors often fail to read over their manuscripts after they have been typewritten.

Contributions must be received two months prior to the date of the issue for which they are intended.

Only the names of actual reviewers for a current number appear.

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